

RAILROAD GAZETTE

QUARTO VOL. XXIV.—NO. 6

A JOURNAL OF TRANSPORTATION, ENGINEERING AND RAILROAD NEWS.

THIRTY-SEVENTH YEAR.

NEW YORK: Published at
73 Broadway.

FRIDAY, FEBRUARY 5, 1892.

ENTERED AT THE POST OFFICE AT NEW YORK, N. Y., AS MAIL MATTER OF THE SECOND CLASS.

\$4.20 PER YEAR TO U.S. AND CANADA.
6.05 " " FOREIGN COUNTRIES.

Brown Brothers & Co.,
PHILA. NEW YORK. BOSTON.
ALEX. BROWN & SONS, BALTIMORE

CONNECTED BY PRIVATE WIRES.
Members N. Y., Phila. and Baltimore Stock Exchs.
We buy and sell all first-class
Investment Securities for customers. We receive accounts of
Banks, Bankers, Corporations,
Firms, and Individuals, on favorable terms, and make collection of drafts drawn abroad on all points in the United States and Canada, and of drafts drawn in the United States on foreign countries.

Letters of Credit.
We also buy and sell Bills of Exchange on, and make cable transfers to all points. Also make collections and issue Commercial and Travelers' Credits available in all parts of the world.

BROWN, SHIPLEY & CO., LONDON.

SEE ADVERTISEMENT, PAGE III.
BLOCK SIGNALS, INTERLOCKING

AND
RAILROAD SAFETY APPLIANCES.

THE
BETHLEHEM IRON COMPANY,

80 Broadway, New York.

STEEL RAILS.

F. G. GORHAM, Sales Agent.

PRINCIPAL OFFICE AND WORKS:

SOUTH BETHLEHEM, PA.

WM. BARCLAY PARSONS
E. M. 800, C. E.,
CIVIL ENGINEER.

35 Broadway, New York.

Bradford L. Gilbert
ARCHITECT,
TOWER BLDG., 59 Broadway, N. Y. City.
Specialty: Railroad Stations.

HOWSON & HOWSON
PATENTS.

Solicitors and Counsellors at Law,
Philadelphia, 119 S. 4th St.
New York, 85 Park Row.
Washington 915 F. St.

A. S. WHITON, No. 115 Broadway,
NEW YORK.

STEEL RAILS, Old Rails and Railway Supplies
Contracts made for delivery in U. S., West Indies,
South America or P. O. B. English Ports.

THE UNION SWITCH & SIGNAL CO.

Office and Works: SWISSVALE (near Pittsburgh), Pa., U. S. A.

Sole Manufacturers of the Westinghouse Pneumatic Interlocking and Automatic Block Signal Systems, Automatic Electric Signals and Electric Locking of Interlocking Levers.

Interlocking and Signaling Appliances for Railway Junctions, Crossings, Terminals and Block Stations. Special appliances for the Protection of Drawbridges, Frogs, Crossings, Switches and Switch Stands. Westinghouse Double-Acting Friction Buffer Drawgear.

Boston Office: New York Office: Chicago Office:
630 Atlantic Avenue. Times Building. Home Insurance Building.
E. H. Goodman, Pres. and Gen. Man. GEO. H. PAINE,
James Johnson, Secretary and Treasurer. Genl. Agent.

THE ROBERT W. HUNT & CO.
BUREAU OF INSPECTION, TESTS AND CONSULTATION
Nos. 631 and 633 THE HOOKERY, CHICAGO, ILL.

BRANCH OFFICES:

HAMILTON BUILDING, PITTSBURGH, PA. NO. 80 BROADWAY, NEW YORK.

322 CHESTNUT STREET, PHILADELPHIA.

ROBERT W. HUNT, M. Am. Soc. C. E., M. Am. Inst. M. E., M. Am. Soc. M. E., Late Gen. Supt. Troy Steel & Iron Co.

JOHN J. CONE, Engineer of Tests. G. W. G. FERRIS, C. E.

A. W. FIERO, Inspecting Engineer. JAMES C. HALLSTED, C. E.

Inspection of Rails, Fish Plates, Cars and other Railway Material. Chemical and Physical Laboratories. Analyses of Ores, Irons, Steels and Oils. Consultation on Iron and Steel Metallurgy and Construction. Northwestern Agents for Riehle Bros.' Testing Machines.

REGINALD CANNING & CO.,
RAILWAY EQUIPMENT,
115 BROADWAY, NEW YORK.

We have in stock, and for sale for Cash or on Car Trust Plan, Locomotives, Passenger Combination and Freight Cars of every description. Send for circulars and photographs.
Correspondence solicited. See issue May 8th, page 11.

ST. LOUIS.
BLACKMER & POST,
MANUFACTURERS OF
SUPERIOR VITRIFIED SALT-GLAZED
STANDARD SEWER PIPE
—AND—
Double Strength Culvert Pipe,
IN TWO AND ONE-HALF FOOT SECTIONS WITH IMPROVED SOCKETS
—FOR—
RAILROAD CULVERTS & WATER WORKS CONDUITS
WRITE FOR PAMPHLET, "SOMETHING ABOUT CULVERT PIPE."
BLACKMER & POST,
ST. LOUIS.

PENNSYLVANIA STEEL CO.,
STEEL RAILS.

New York Office, 2 Wall Street.

STEPHEN W. BALDWIN, Agent.

CHAS. S. CLARK, 70 Kilby St., Boston, Mass.

G. D. PETERS & CO.,

Moorgate Works, Moorfields, London, Eng.,
MANUFACTURERS OF

RAILWAY SUPPLIES.

New inventions introduced and the sale and manufacture of specialties undertaken.

OLIVER ADAMS

32 Liberty St., N. Y. P. O. Box 1364.
NEW YORK.

CAR promptly negotiated for large and small amounts.

TRUSTS

GEO. A. EVANS,

40 WALL STREET, NEW YORK.

STEEL RAILS,

LOCOMOTIVES,

Passenger and Freight Cars.

Railway Fastenings, Frogs and Switches.

NEW JERSEY

COLD STORAGE & REPAIR CO.,

LAKE VIEW, N. J.; on N. Y., L. E. & W. R. R.;
14 miles from New York.

Trucks for Storage of Railway Equipment of All Kinds, by the Piece or in Quantity.

Facilities for the Repair of Rolling Stock, including Locomotives, Engines, and Cars.

Have for sale, repaired, ready for immediate delivery:

18 x 24 in. ten-wheel Freight Engines.

Passenger, Excursion, Combination and Baggage, Mail and Express Coach, Box, Flat and Dump Cars.

Street Cars, 10, 12 and 16 ft.

TURNBUCKLES

Cleveland City Forge & Iron Co.,
CLEVELAND, O.

New York Office, 136 Liberty St.

SIGNALING

Interlocking Switch and Signal Apparatus. Semaphore Block and Station Signals. Frogs and Crossings. Switches and Switch Stands.

ALLENTOWN ROLLING MILLS.

Switch and Signal Dept., FRED'K S. GUERBER, M'gr. Office and Works, ALLENTOWN, PA.

INTERLOCKING

NEW YORK EQUIPMENT COMPANY
15 WALL STREET, NEW YORK.
Have For Sale, for Cash or Lease on Easy Terms on the Car-Trust Plan,
LOCOMOTIVES, PASSENGER AND FREIGHT CARS, ETC.,
Of both Standard and Narrow Gauge, to Railroad Companies, Logging Railroads, Mining Companies, Contractors, etc.
WE HAVE READY FOR IMMEDIATE DELIVERY, IN PERFECT ORDER,
Six standard-gauge locomotives, and a large number of 20 and 25-ton coal and flat cars.

JAMES IRVINE, President. GEO. B. F. COOPER, Vice-President. WM. V. CAROLIN, Secretary and Treasurer.

THE JOHNSON RAILROAD SIGNAL CO.,
Designers and Manufacturers of
Railroad Signaling Appliances,
INTERLOCKING and BLOCK SIGNALS.

Plans and bids submitted for interlocking Grade Crossings, Junctions, Yards, Terminals, Passing Stations, etc.

DISTANT SWITCH SIGNALS.

ELECTRIC REPEATERS.

TORPEDO ATTACHMENTS.

Works and Main Office, RAHWAY, N. J. New York Office, 47 BROADWAY.

ALBERT LUCIUS
CIVIL AND MECHANICAL ENGINEER,
71 Broadway, N. Y. All kinds of Engineering Structures, Plans, Specifications, Estimates, Superintendence, Bridge Inspection & Reports.

George P. Whittlesey, Railroad Inventions a specialty.
Late Examiner U. S. Patent Off.
All atie Building. WASHINGTON, D. C., U. S. A.

PATENTS.

LOCOMOTIVE POP VALVES

THE ASHTON VALVES THE MOST EFFICIENT VALVES MADE.

THE ASHTON VALVE CO.

271 Franklin St., BOSTON
218 Lake St., CHICAGO
107 Liberty St., NEW YORK

WILSON BROTHERS & CO.,
Civil Engineers and Architects,
DREXEL BUILDING, PHILADELPHIA, PA.

Surveys made for Railway Lines.

Plans and Specifications Furnished for Buildings, Bridges, Water Works, Sewerage Systems, Harbor Improvements and all classes of Engineering and Architectural Work.

Construction of Work Attended To.

Examinations made of Railway, Mining and Other Properties.

STEEL RAILS AND RAILWAY EQUIPMENT

O. W. CHILDS & CO., 115 N. Y., N. Y.

TAYLOR.

BEST YORKSHIRE BAR IRON

The best material for Staybolts, Piston Rods, Crank Pins, etc.

USED BY LEADING RAILROADS.

Sole Representatives in the United States,

B. M. JONES & CO.,

Nos. 11 & 13 Oliver St., BOSTON.

No. 143 Liberty St., NEW YORK.

PITTSBURGH TESTING LABORATORY.

HUNT & CLAPP, 95 Fifth Ave., Pittsburgh, Pa.

METALLURGICAL ENGINEERS AND CHEMISTS.

Specialties. Inspection of rails and of material for bridges and other structures. Chemical analyses and physical tests of all kinds. Agency for Tinius Olsen & Co.'s testing machines and Thacher's Slide Rule. Slide rules kept constantly in stock. Price, \$30.00.

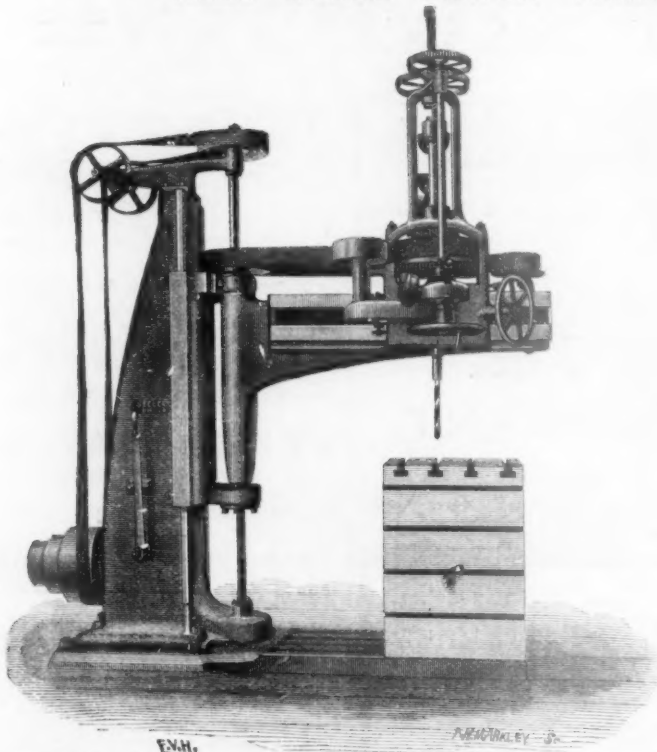
F. W. DEVOE & CO.'S COLORS AND VARNISHES ARE STANDARDS

WM. SELLERS & CO., INCORPORATED

PHILADELPHIA, PA.

IMPROVED MACHINE TOOLS,

TURN-TABLES FOR LOCOMOTIVES, CARS AND PIVOT BRIDGES,
HIGH SPEED POWER TRAVELING CRANES, SWING CRANES, ETC.



IMPROVED

Lathes, Planers, Drilling and Boring Machines,
Car Wheel Boring Mills, Axle Lathes,
Steam Hammers, Wheel
Presses, etc., etc.

Improved Injectors for Locomotive and
Stationary Boiler Service.

SHAFTING AND ALL ITS ACCESSORIES A SPECIALTY.

President, IRA DIMOCK,
NORTHAMPTON

Established 1876.

Treasurer, J. L. OTIS.

**Emery
Wheel Co.**

MANUFACTURERS OF
PATENT
SOLID EMERY
AND
Corundum Wheels
AND
MACHINERY.

Leeds, Mass

Chicago Office, 20 South Canal Street.

AMERICAN PRACTICE

BLOCK SIGNALING,

With Descriptions and Drawings of the Different Systems
in Use on Railroads in the United States.

This is a handsomely printed, elegantly bound volume, 7 3/4 in. x 9 in. It describes clearly the Simple Block System, Single Track Blocking Sykes' System, Automatic Clockwork Track Circuit Signals and the Electro-Pneumatic Track-Circuit System. It contains elaborately illustrated descriptions of the systems in use on the Pennsylvania, Boston & Albany, Fitchburg and New York Central roads, and correct engravings and descriptions of the Westinghouse Pneumatic, the Hall Automatic and Black's Automatic Systems; and also of the Illuminated Semaphore, Koyl's Parabolic Semaphore and the Stewart Hall Train Order Signal. The book is designed to make the methods of block signaling clearly understood and to show the present development of the art on American railroads.

PRICE, \$2.00.

PUBLISHED AND FOR SALE BY

THE RAILROAD GAZETTE, 73 Broadway, New York.

PAMPHLETS, PRICES, ETC., FURNISHED ON APPLICATION.

NILES TOOL WORKS

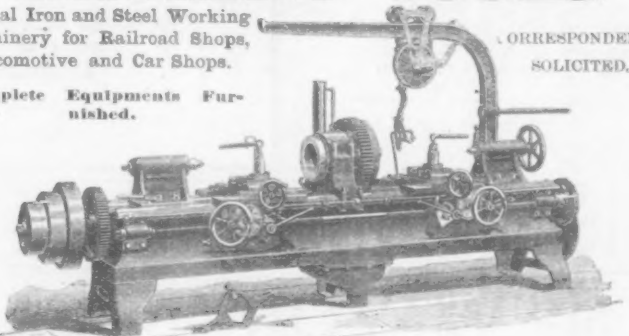
HAMILTON, OHIO.

MACHINE TOOLS.

Special Iron and Steel Working
Machinery for Railroad Shops,
Locomotive and Car Shops.

Complete Equipments Fur-
nished.

CORRESPONDENCE
SOLICITED.



NEW YORK,
136 & 138 Liberty St.

PHILADELPHIA,
705 Arch St.

PITTSBURGH,
Lewis Block.

CHICAGO,
Phoenix Building.



MICHIGAN FORCE & IRON CO.,

No. 1 Newberry Bldg., Detroit, Mich.,

Manufacturers of

MERCHANT BAR IRON,

And all kinds of

Car and Driving Axles, Links and Pins, Shafting and Forgings.

JAMES McMILLAN, Pres. HUGH McMILLAN Vice-Pres. W. C. McMILLAN, Gen. Man.
J. B. BAUGH, Gen. Supt. S. A. BAUGH, Supt. R. D. FIELD, Sec. W. J. ANDERSON, Treas.

THE THOMSON-HOUSTON SYSTEM

— OF —

ALTERNATE CURRENT INCANDESCENT LIGHTING

Should it be found necessary to supply incandescent lamps at a considerable distance from the place in which the generating plant is located, this system will be found a most reliable one. Its use renders it possible to do lighting at long distances from the source of supply with greater ease and economy than any other system.

Send for Catalogue on Alternating Current Apparatus.

THOMSON-HOUSTON ELECTRIC CO.

620 Atlantic Avenue, Boston, Mass.
Traders' Bank Building, Atlanta, Ga.

115 Broadway, New York, N. Y.

German National Bank Building, Pittsburgh, Pa.

831 New York Life Building, Kansas City, Mo.

115 North Third St., St. Louis, Mo.

15 First Street, San Francisco, Cal.

148 Michigan Avenue, Chicago, Ill.

405 Sibley Street, St. Paul, Minn.

509 Arch Street, Philadelphia, Pa.

1329 F Street, Washington, D. C.

New Kirk Building, Syracuse, N. Y.

24 West Fourth Street, Cincinnati, O.

200 First Street, Portland, Ore.

R. CARMAN COMBES,
President.

THOS. J. SWIFT,
Managing Director.

J. W. LATTIG,
Gen'l Supt. and Treas.

H. S. PFEIL,
Gen'l Agt. and Sig. Engr.

NATIONAL SWITCH & SIGNAL COMPANY

Office and Works: **EASTON, PENNA.**

—DESIGNERS AND MANUFACTURERS OF—

RAILROAD SAFETY APPLIANCES.

Mechanical and Electrical Interlocking, Electric Block Signals
and Distant Switch Signals.

PLANS MADE AND BIDS SUBMITTED FOR INTERLOCKING TERMINALS, YARDS, JUNCTIONS, GRADE CROSSINGS, DRAW-
BRIDGES, PASSING STATIONS, etc.

SPECIAL APPLIANCES:

Koys' Parabolic Illuminated Semaphore,

National Torpedo Machine,

M. & S. Double-Wire Compensator,

National Selector,

Adjustable Clamp Pipe Lug.

New York Office: 41 Pine St.

Southern Agent: J. A. CHISHOLM, Savannah Ga.

WESTERN UNION TELEGRAPH OFFICE AT THE WORKS

AIR BRAKES.

The New York Air Brake Co. has taken more orders for car equipment in the last three months than the Westinghouse Company received in the first three years after bringing out their new freight car brakes.

The New York Air Brake is Sixty Dollars cheaper per engine, Twenty Dollars cheaper per passenger car, and Five Dollars cheaper per freight car than the Westinghouse, thus effecting a saving of 12 1-2 to 25 per cent. in price, which amounts to thousands of dollars saving to the Railroad Companies. This saving does not mean a poorer brake, for the pump, engineer's valve and other parts are acknowledged to be superior to the Westinghouse, and are being ordered to replace them on many roads, quite outside of large orders for new equipment. Careful personal investigation of our brake by practical railroad men has resulted in large orders, thus substantiating our claims.

We should be happy to see railroad men at our Works in Watertown to show them the operation of our brake on a fifty car train, both by itself and in combination with the Westinghouse equipment; and an inspection of our Works turning out one hundred car brakes per day would also prove interesting.

THE NEW YORK AIR BRAKE CO.,

115 BROADWAY, NEW YORK CITY.

ROYAL C. VILAS, President.

CHAS A. STARBUCK, Vice-President.

JOHN C. THOMPSON, Secretary and Treasurer.

A. P. MASSEY, Mechanical Engineer.

ACCIDENTS FROM
TRACK SPREADING
PREVENTED.



SIDE VIEW.

THE SHOULDER TIE PLATE

1. Prevents Widening of the Gauge.
2. Prolongs the Life of the Tie.
3. Prevents Cutting at Neck of the Spike.

The rail bearing against the shoulder brings into use the inside as well as the outside of spike, doubles the present resistance to lateral thrust and thus effectually prevents spreading of the track. Especially adapted for use in Yards, at Terminals, and on Curves and Bridges.

THE SHOULDER TIE PLATE is in use on thirteen railroads. Among others, the Norfolk Southern, Central of New Jersey, Louisville & Nashville, Pittsburgh & Western, Long Island, White Electric, etc., etc.

THE SHOULDER TIE-PLATE COMPANY,

GENERAL OFFICE: J. T. STEWART, Sec. and Treas., 1511-1515 N. 31st St., PHILADELPHIA.

BRANCH OFFICES: (SIGOURNEY P. CLARK, 18 Front St. NEW YORK.

(C. I. WICKERSHAM, The Hookery, CHICAGO, ILL.

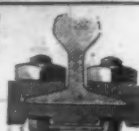
Send for Circulars and Samples for Trial.

Rail Ends carried directly by the arched beam and screwed DOWN to it with a force of 15,000 lbs.—making practically a continuous rail. Whole surface of base for support and wear. No breakage of Rails or Joints. No "low joints." No "creeping." No loose nuts. Cost of keeping up track reduced to one-third of that with Angle Bars and giving smoother surface.

ALL OF WROUGHT IRON AND STEEL.

For further information address

FISHER RAIL JOINT WORKS, Trenton, N. J.



1/4 of Full Size.

Boughtons Safety Car Seal

IS THE ONLY CAR SEAL RECOGNIZED BY THE
UNITED STATES GOVERNMENT'S
& ENGLISH GOVERNMENT'S

BUFFALO SEAL & PRESS CO., BUFFALO, N. Y., U.S.A.

ALPHABETICAL INDEX TO ADVERTISEMENTS.

Abendroth & Root Mfg. Co., XXX	C. R. & Q. R. B., XXX	Gates Iron Works, XXX	Louisville Bridge & Iron Works, XXX	Pennsylvania Steel Co., Pa., XL	Southern, Inc. & Co., XXX
Acme Machy, Co., XXX	C. C. & M. L. Ry., XXX	Gilbert, Bradford L., XXX	Louisville Steam Forge Co., XL	Perry Ventilator Co., XXX	Southern & Pac. Refrigerator
Adams, Oliver, XXX	C. H. & D. Ry., XXX	Gill-Alexander Elec. Mfg. Co., XXX	Ludlow, Albert, XXX	Philadelphia Bridge Works, XXX	Spon, E. & F. S., & Co., XXX
Adams & Westlake Co., XXX	C. M. & St. P. Ry., XXX	Gold Car Heating Co., XXX	Ludlow Valve Mfg. Co., XXX	Philadelphia Engineering Wks., XXX	Sprague, Duncan & Hutchinson, XX
Allen Paper Car Wheel Co., XXX	C. R. I. & P. Ry., XXX	Goodwin, J. B., XXX	Lukens Iron & Steel Co., XXX	Phosphor Bronze Smelting Co., XXX	Springfield Iron Co., XXX
Allenstown Rolling Mills, XXX	Chicago & Alton R. R., XXX	Goetz & Eberhardt, XXX	Males, A. S. & Co., XXX	Pittsburgh Bridge Co., XXX	Standard Car Coupling Co., XXX
Am. Const. Draw-Ing Co., XXX	Chicago & N. W. Ry., XXX	Greely, E. S. & Co., XXX	Manning, Maxwell & Moore, XXX	Pittsburgh Forge & Iron Co., XXX	Standard Steel Works, XXX
American Steel Wheel Co., XXX	Chicoma, O. W., & Co., XXX	Greenlee Bros. & Co., XXX	Markham Steam Shovel Co., XXX	Pittsburgh Reduction Co., XXX	Standard Thermometer Co., XXX
American Supply Co., XXX	Chicoma City Forge & Iron Co., XXX	Guarantee Co. N. A., XXX	Martin Anti-Vire Car Heater, XXX	Pittsburgh Testing Laboratory, XXX	Stiles & Parker Press Co., XXX
Anderson & Barr, XXX	Cleveland Frog & Crossing Co., XXX	Hale & Kilburn Mfg. Co., XXX	McClure, Alex., XXX	Place, Geo., XXX	Stilger & Struder Auto. Car
Anderson Pains & Color Co., XXX	Condong Brake Shoe Co., XXX	Hall Signal Co., XXX	McClure, Alex., XXX	Porter, H. S. & Co., XXX	Stow Flexible Shaft Co., XXX
Appleton, Thomas, XXX	Consolidated Car Heating Co., XXX	Hammett, M. C., XXX	McClure, Alex., XXX	Pottsville Bridge Co., XXX	Tait & Carlton, XXX
Ashecroft Mfg. Co., XXX	Cook Loco. & Mach. Co., XXX	Harrington, Edw., XXX	McClure, Alex., XXX	Pratt & Leshworth, XXX	Tanley Co., XXX
Ashton Valve Co., XXX	Cook Well Co., The, XXX	Hartford Steam Boiler L. Co., XXX	McClure, Alex., XXX	Pratt & Leshworth, XXX	Taylor Iron & Steel Co., XXX
Atkinson Steel & Pipe Works, XXX	Copeland & Bacon, XXX	Hartford Woven Wire Mattress Co., XXX	McClure, Alex., XXX	Pratt & Leshworth, XXX	Thompson Car Coupling Co., XXX
Austin, F. C. Mfg. Co., XXX	Crescent Lumber & Const. Co., XXX	Harvey Steel Car Co., XXX	McClure, Alex., XXX	Pratt & Leshworth, XXX	Thompson-Houston Electric Co., XXX
Auto-Interchangeable Car Comp. Co., XXX	Cross, J. J. R., XXX	Hayes Tool Co., XXX	McClure, Alex., XXX	Pratt & Leshworth, XXX	Thompson, J. L. Mfg. Co., XXX
Baldwin Loco. Works, XXX	Curtis Regulator Co., XXX	Heller & Brightly, XXX	McClure, Alex., XXX	Pratt & Leshworth, XXX	Thurmond Car Coupling Co., XXX
Baldwin Car Wheel Co., XXX	Cushion Car Wheel Co., XXX	Hendricks Bros., XXX	McClure, Alex., XXX	Pratt & Leshworth, XXX	Trautwine, Jno. C., Jr., XXX
Barnes, D. L., XXX	Davenport & Fairbairn, XXX	Hinson Car Coupler Co., XXX	McClure, Alex., XXX	Pratt & Leshworth, XXX	Trenton Iron Co., XXX
Baum & Richardson, XXX	Dayton Mfg. Co., XXX	Hiscope Tunnel Route, XXX	McClure, Alex., XXX	Pratt & Leshworth, XXX	Trojan Car Coupler Co., XXX
Beale Railway Brake Co., XXX	De La Verne Ref. Mach. Co., XXX	Hopkins, D. A. Mfg. Co., XXX	McClure, Alex., XXX	Pratt & Leshworth, XXX	Union Bridge Co., XXX
Bement, Mills & Co., XXX	De La Verne Ref. Mach. Co., XXX	Howard & Howard, XXX	McClure, Alex., XXX	Pratt & Leshworth, XXX	Union Iron Works, XXX
Berlin Iron Bridge Co., XXX	De La Verne Ref. Mach. Co., XXX	Humphreys & Sayce, XXX	McClure, Alex., XXX	Pratt & Leshworth, XXX	Union Switch & Signal Co., XXX
Berry & Orton Co., XXX	De La Verne Ref. Mach. Co., XXX	Hunt, C. W. Co., XXX	McClure, Alex., XXX	Pratt & Leshworth, XXX	Universal Radial Drill Co., XXX
Bethlehem Iron Co., XXX	De La Verne Ref. Mach. Co., XXX	Hunt, C. W. Co., XXX	McClure, Alex., XXX	Pratt & Leshworth, XXX	Valle & Young, XXX
Billings & Spencer Co., XXX	De La Verne Ref. Mach. Co., XXX	Hunt, C. W. Co., XXX	McClure, Alex., XXX	Pratt & Leshworth, XXX	Valley Pump Co., XXX
Blackmer & Post, XXX	De La Verne Ref. Mach. Co., XXX	Hunt, C. W. Co., XXX	McClure, Alex., XXX	Pratt & Leshworth, XXX	Van Dusen Cushioned C. C. K. Co., XXX
Bliss, E. W. & Co., XXX	De La Verne Ref. Mach. Co., XXX	Hunt, C. W. Co., XXX	McClure, Alex., XXX	Pratt & Leshworth, XXX	Van Every, Geo. B., XXX
Bloomington Car Co., XXX	De La Verne Ref. Mach. Co., XXX	Hunt, C. W. Co., XXX	McClure, Alex., XXX	Pratt & Leshworth, XXX	Van Noorden, E. & Co., XXX
Bogus & Mills Mfg. Co., XXX	De La Verne Ref. Mach. Co., XXX	Hunt, C. W. Co., XXX	McClure, Alex., XXX	Pratt & Leshworth, XXX	Van Schen & Gardner, XXX
Boston Bridge Works, XXX	De La Verne Ref. Mach. Co., XXX	Hunt, C. W. Co., XXX	McClure, Alex., XXX	Pratt & Leshworth, XXX	Vulcan Iron Works (Chicago), XXX
Boston Winger Co., XXX	De La Verne Ref. Mach. Co., XXX	Hunt, C. W. Co., XXX	McClure, Alex., XXX	Pratt & Leshworth, XXX	Vulcan Iron Works (Tulsa), XXX
Boston & Albany R. R., XXX	De La Verne Ref. Mach. Co., XXX	Hunt, C. W. Co., XXX	McClure, Alex., XXX	Pratt & Leshworth, XXX	Waddell, J. A. L., XXX
Boston & Lockport, XXX	De La Verne Ref. Mach. Co., XXX	Hunt, C. W. Co., XXX	McClure, Alex., XXX	Pratt & Leshworth, XXX	Wadsworth Iron Works, XXX
Bouscaren, Geo., XXX	De La Verne Ref. Mach. Co., XXX	Hunt, C. W. Co., XXX	McClure, Alex., XXX	Pratt & Leshworth, XXX	Wagon Mfg. Co., XXX
Bowler & Co., XXX	De La Verne Ref. Mach. Co., XXX	Hunt, C. W. Co., XXX	McClure, Alex., XXX	Pratt & Leshworth, XXX	Watson & Stillman, XXX
Bowling Brake Co., XXX	De La Verne Ref. Mach. Co., XXX	Hunt, C. W. Co., XXX	McClure, Alex., XXX	Pratt & Leshworth, XXX	Weiss Pavement Co., XXX
Bradley, Osmond & Son, XXX	De La Verne Ref. Mach. Co., XXX	Hunt, C. W. Co., XXX	McClure, Alex., XXX	Pratt & Leshworth, XXX	Weiss, Fred C., XXX
Brightly, C. H., XXX	De La Verne Ref. Mach. Co., XXX	Hunt, C. W. Co., XXX	McClure, Alex., XXX	Pratt & Leshworth, XXX	Westinghouse Air Brake Co., XXX
Brill, J. G. & Co., XXX	De La Verne Ref. Mach. Co., XXX	Hunt, C. W. Co., XXX	McClure, Alex., XXX	Pratt & Leshworth, XXX	Westinghouse Machine Co., XXX
Brooks Loco. Wks., XXX	De La Verne Ref. Mach. Co., XXX	Hunt, C. W. Co., XXX	McClure, Alex., XXX	Pratt & Leshworth, XXX	Wharton Railroad Switch Co., XXX
Brown Bros. & Co., XXX	De La Verne Ref. Mach. Co., XXX	Hunt, C. W. Co., XXX	McClure, Alex., XXX	Pratt & Leshworth, XXX	White, Jno. A. Co., XXX
Brown & Sharpe Mfg. Co., XXX	De La Verne Ref. Mach. Co., XXX	Hunt, C. W. Co., XXX	McClure, Alex., XXX	Pratt & Leshworth, XXX	Whitney, A. & Son, XXX
Bryant & Sharkey, Boston, XXX	De La Verne Ref. Mach. Co., XXX	Hunt, C. W. Co., XXX	McClure, Alex., XXX	Pratt & Leshworth, XXX	Whitton, A. & Son, XXX
Bucyrus Steam Shovel & Dredge Co., XXX	De La Verne Ref. Mach. Co., XXX	Hunt, C. W. Co., XXX	McClure, Alex., XXX	Pratt & Leshworth, XXX	Williams, H. A. Mfg. Co., XXX
Buda Foundry & Mfg. Co., XXX	De La Verne Ref. Mach. Co., XXX	Hunt, C. W. Co., XXX	McClure, Alex., XXX	Pratt & Leshworth, XXX	Williams, White & Co., XXX
Buffalo Seal & Press Co., XXX	De La Verne Ref. Mach. Co., XXX	Hunt, C. W. Co., XXX	McClure, Alex., XXX	Pratt & Leshworth, XXX	Wilson Bros. & Co., XXX
Burkhardt's, Geo. J. Son, XXX	De La Verne Ref. Mach. Co., XXX	Hunt, C. W. Co., XXX	McClure, Alex., XXX	Pratt & Leshworth, XXX	Wood, R. D. & Co., XXX
Butler Drawbar Attachment Co., XXX	De La Verne Ref. Mach. Co., XXX	Hunt, C. W. Co., XXX	McClure, Alex., XXX	Pratt & Leshworth, XXX	Worthington, Henry R., XXX
Byram & Co., XXX	De La Verne Ref. Mach. Co., XXX	Hunt, C. W. Co., XXX	McClure, Alex., XXX	Pratt & Leshworth, XXX	Yale & Towne Mfg. Co., XXX
Caldwell Mfg. Co., XXX	De La Verne Ref. Mach. Co., XXX	Hunt, C. W. Co., XXX	McClure, Alex., XXX	Pratt & Leshworth, XXX	Youngtown Bridge Co., XXX
Cambria Iron Co., XXX	De La Verne Ref. Mach. Co., XXX	Hunt, C. W. Co., XXX	McClure, Alex., XXX	Pratt & Leshworth, XXX	Youngtown Car Mfg. Co., XXX
Campbell, W. H., XXX	De La Verne Ref. Mach. Co., XXX	Hunt, C. W. Co., XXX	McClure, Alex., XXX	Pratt & Leshworth, XXX	Young & Sons, XXX
Canning, R. & Co., XXX	De La Verne Ref. Mach. Co., XXX	Hunt, C. W. Co., XXX	McClure, Alex., XXX	Pratt & Leshworth, XXX	
Caruth Wheel & Foundry Co., XXX	De La Verne Ref. Mach. Co., XXX	Hunt, C. W. Co., XXX	McClure, Alex., XXX	Pratt & Leshworth, XXX	
Central Iron & Steel Co., XXX	De La Verne Ref. Mach. Co., XXX	Hunt, C. W. Co., XXX	McClure, Alex., XXX	Pratt & Leshworth, XXX	
Chester Steel Castings Co., XXX	De La Verne Ref. Mach. Co., XXX	Hunt, C. W. Co., XXX	McClure, Alex., XXX	Pratt & Leshworth, XXX	
Chicago Bridge & Iron Co., XXX	De La Verne Ref. Mach. Co., XXX	Hunt, C. W. Co., XXX	McClure, Alex., XXX	Pratt & Leshworth, XXX	

GRAPHITE PAINT.

For Tin or Shingle Roofs and Iron Work.
It is Absolutely Without an Equal. A tin roof well painted will not need repainting for 10 to 15 years. If you need any paint it will pay you to send for circular.
JOSEPH DIXON CRUCIBLE CO., Jersey City, N. J.

THE COOK WELL CO.,

705 Market Street, St. Louis, Mo.

"Cook's System of Tube Wells,"

For Water-Works, Railway Stations, Factories, Breweries, etc.

The practical experience of eighteen years in Well Sinking in almost every State in the Union enables us to determine the best Practical and most economical Method of Securing the most Satisfactory Results in procuring a Water Supply. We claim that the Tube Well Material manufactured by us is without an equal in the United States, and we have abundant testimonials in support of our claim. Estimates made on work in all parts of the United States. We refer the public to the Memphis Artesian Water Company, by whom our system is solely and entirely used.

Catalogues Mailed on Application.

RE-ORGANIZATION.

We announce to our patrons and the public generally, that the business heretofore conducted by JOHN A. WHITE of Concord, N. H., under the name of the CONCORD MACHINE WORKS, has been re-organized under the name of the JOHN A. WHITE COMPANY, and has been removed to Dover, N. H.

With large and improved facilities we shall maintain the high standard of workmanship already acquired, and solicit your patronage.

THE BEST WOOD-WORKING MACHINERY IN THE WORLD.

DICKSON CAR WHEEL CO.,

Manufacturers of all Sizes of ENGINE, TENDERS and

CAR WHEELS,

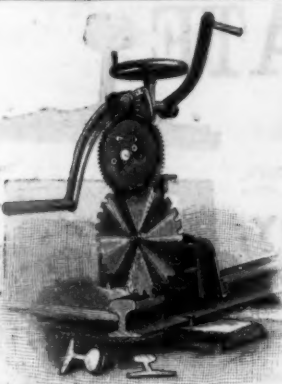
In either the COMMON or

BARR PATENT CONTRACTING CHILL,

from the celebrated TEXAS CAR-WHEEL IRON. All wheels subject to M. C. B. drop test, "BARR" wheels are ground smooth and true, and the 29-inch guaranteed to run 70,000 miles.

ANNUAL CAPACITY, 50,000 WHEELS.

Office and works, - HOUSTON, TEX.



BRYANT'S PORTABLE RAIL SAW.

Guaranteed to Cut ANY Rail from 20
degrees to 45 degrees.

BRYANT & BARBEY,
79 MILK ST., BOSTON.

COPELAND & BACON.

HOISTING & WINDING ENGINES

ORE (RUSHERS),
ORE WASHERS,
CONCENTRATING
MACHINERY,
GRAVITY INCINERATORS,
STONE (RUSHERS),
RAILROAD CRANES.

85 LIBERTY ST.,
NEW YORK.

535 ARCH ST.,
PHILADELPHIA.

RAILROAD GAZETTE DIRECTORY, CLASSIFIED ADVERTISEMENTS.

Air Brake Fittings
Stanley G. Flagg & Co., Phila.
Air Brake Hose
N. Y. Belt & Pack Co., 15 Park Row, N. Y.
Air Brake Regulator
Wason Regulator Co., Boston.
Air Compressors & Rock Drills
Ingersoll-Sergeant Rock Drill Co., 10
Park Place, N. Y.
Rand Drill Co., 22 Park Place, N. Y.
Aluminum
Pittsburgh Reduction Co.
Architect
Bradford L. Gilbert, 50 Broadway, N. Y.
Thomas Appleton, 305 Rialto Bldg., Chic.
Asbestos Packing
H. W. Johns Mfg. Co., N. Y. City.
Asphalt Pavement
Wohn Pavement Co., 16 E. 4th St., N. Y.
Axles
Cambria Iron Co., Johnstown, Pa.
Lima Machine Works, Lima, O.
Louisville Steam Forge Co., Louisv., Ky.
Michigan Car Co., Detroit, Mich.
Mich. Forge & Iron Co., Detroit, Mich.
Midvale Steel Co., Newtown, Phila.
Pittsburgh Forge & Iron Co., Phila.
T. Prosser & Son, 15 Gold St., N. Y.
Brass Slide Valves
H. C. Hammett, Troy, N. Y.
Brilliant Locomotives
Marion Steam Shovel Co., Marion, O.
Brinkers
Brown Bros. & Co., 59 Wall street, N. Y.
Brill Cord & Couplings
Sims Cordage Works, Boston, Mass.
Bricks
Boston & Lockport Brick Co., Boston.
Boilers
Abendroth & Root Mfg. Co., 28 Cliff St., N. Y.
Lidgerwood Mfg. Co., 96 Liberty St., N. Y.
Rich. Loco. & Mach. Co., Richmond, Va.
Boiler Plate
Schoenberger & Co., Pittsburgh, Pa.
Boiler Cutters
Acme Machinery Co., Cleveland, O.
Howard Iron Works, Buffalo, N. Y.
Boilers & Nuts
American Supply Co., Kansas City, Mo.
Fuller Bros. & Co., 129 Gr'nwich St., N. Y.
Rhode Island Tool Co., Providence.
Books & Publications
E. & F. N. Spon & Co., 12 Court St., N. Y.
John C. Trautwine, Jr.
Brake Adjusters
G. & C. Co., Chicago.
Brake Beams
Nat. Hollow Brake Beam Co., Chic., Ill.
Northwestern Equipment Co., Chicago.
Schoen Mfg. Co., Pittsburgh.
Brake Shoes
Beales Ry. Brake Co., 53 Broadway, N. Y.
Boydens Brake Co., Baltimore, Md.
Westinghouse Air-Brake Co., Phila., Pa.
Brake-Shoes
Congdon Brake-Shoe Co., Chicago, Ill.
Lippin Brake-Shoe Co., 48 Broadway, N. Y.
Hamapo (N. Y.) Wheel & Foundry Co.
Bridges
Anderson & Barr, Jersey City, N. J.
Berlin Iron Bridge Co., E. Berlin, Conn.
Boston Bridge Works, Boston, Mass.
Chicago Bridge & Iron Co., Chicago, Ill.
Cottrell & Saylor, Philadelphia, Pa.
Edgemoor Bridge Works, Wilmington, Del.
Elmhurst Bridge Co., Elmira, N. Y.
S. W. Freeseon, World Bldg., N. Y.
Keystone Bridge Co., Pittsburgh, Pa.
King Iron Bridge Mfg. Co., Cleveland, O.
Louisville Bridge & Iron Co., Louisv., Ky.
Mo. Val. Br. & Ir. Wks., Leavenworth, Kan.
Mt. Vernon Bridge Co., Mt. Vernon, O.
New Jersey Steel & Iron Co., Trenton.
Passaic Rolling Mill, Paterson, N. J.

Phoenixville Bridge Co., Phila., Pa.
Pittsburgh Bridge Co., 1105 Owings Bldg.,
Chicago.
Pottsville Bridge Co., Phila.
Rochester Bridge & Ir. Wks., Rochester.
A. & P. Roberts & Co., Philadelphia, Pa.
San Francisco Bridge Co., California.
Shaler & Schindler, Chicago, Ill.
Shaffer Bridge Co., Pittsburgh, Pa.
Sooyemith & Co., 2 Nassau street, N. Y.
Union Bridge Co., 15 Broadway, N. Y.
J. A. L. Waddell, Kansas City, Mo.
Walla Iron Works, Jersey City, N. J.
Yonkersville (Ohio) Bridge Co.
Bridge Machinery
Alexander McClure, Pittsburgh, Pa.
Bridge Timbers
Berlin Iron Bridge Co., E. Berlin, Conn.
Buildings
Williams, White & Co., Moline, Ill.
Buildings
Berlin Iron Bridge Co., E. Berlin, Conn.
Buildings
Williams, White & Co., Moline, Ill.
Cars
American Supply Co., Kansas City, Mo.
Bloomington Car Co., Bloomington, Pa.
Osgood Bradley & Sons, Worcester, Mass.
J. G. Brill & Co., Philadelphia, Pa.
Reginald Canning & Co., 115 E'way, N. Y.
Ensign Mfg. Co., Huntington, West Va.
Erie Car Works (Limited), Erie, Pa.
Harvey Steel Car Co., Chicago, Ill.
Jackson & Sharp Co., Wilmington, Del.
Jackson & Woodin Mfg. Co., Berwick, Pa.
A. S. Males & Co., Cincinnati.
Michigan Car Co., Detroit, Mich.
Middletown Car Wks., Middletown, Pa.
N. Y. Equipment Co., 15 Wall St., N. Y.
R. M. Pancoast, Camden, N. J.
Pardee Car & Mach. Wks., Watson's, Pa.
South Baltimore Car Works, Baltimore.
St. Charles Car Co., St. Charles, Mo.
Wason Mfg. Co., Springfield, Mass.
Youngstown (Ohio) Car Mfg. Co.
Cars, Second Hand
Reginald Canning & Co., 115 E'way, N. Y.
N. Y. Equipment Co., 15 Wall St., N. Y.
Car Couplings
Auto. Interchangeable Car Coupler Co.,
San Francisco, Cal.
Drexel Car Coupler Co., Rookery, Chic.
Gould Coupler Co., Buffalo, N. Y.
Hinson Car Coupler Co., Chicago, Ill.
McConway & Torley Co., Pittsburgh, Pa.
McGill Iron Wks. Co., Peoria, Ill.
St. Louis Car Coupler Co., St. Louis, Mo.
Smithie Coupler & Mfg. Co., Newark, N. J.
Stilger & Stroser Aut. Car Coupl. Co.,
Louisville, Ky.
The Standard Car Coupl. Co., Troy, N. Y.
Trojan Car Coupler Co., Troy, N. Y.
Thurmond Car Coupl. Co., 80 E'way, N. Y.
Van Dorston Coupl. Co., Phila., Pa.
Car Doors
Q. & C. Co., Chicago, Ill.
Car Furnishings
Dayton Mfg. Co., Dayton, O.
Car Heaters
Baker Heater Co., 799 Gr'nwich St., N. Y.
Consol. Car Heating Co., Albany, N. Y.
Gold Car Heat. Co., Frankfort, N. Y.
Hartman & F. Car Heat. Co., Dunkirk, N. Y.
Morton Safety Heating Co.
National Car Heating Co., Chicago.
Railroad Lighting & Mfg. Co., Phila., Pa.
Safety Car Heat. & Light Co., 190 E'way,
N. Y.
Car Heating Equipment
Stanley G. Flagg & Co., Philadelphia.
Car Machinery
Greenlee Bros. & Co., Chicago.
Car Pin form tires
J. B. Goodwin, 29 E'way, N. Y.
Car Plushes
Sanford Mills, 120 Wash'ton St., Boston.

Car Pushers
Boston & Lockport Brick Co., Boston.
Car Replacers
Q. & C. Co., Chicago.
Car Seats
Hartford Woven Wire Mattress Co.,
Hartford, Conn.
Hale & Kilburn Mfg. Co., Phila.
Car Seals
Buffalo Seal & Press Co., Buffalo, N. Y.
Car Roofs
C. E. Hutchins' Sons, Detroit.
Les Composite Mfg. Co., New York.
Car Underframing
Knitted Mattress Co., Canton, Mass.
Car Wheel Presses
Finlay Olsen & Co., Philadelphia, Pa.
Car Wheels
Allen Paper Car-Wheel Co., Chicago, Ill.
American Steel Wheel Co., N. Y. City.
Baltimore Car-Wheel Co., Baltimore, Md.
Barnum & Richardson Mfg. Co., Chic.
Bowler & Co., Cleveland.
Cayuta Wheel & Foundry Co., Sayre, Pa.
Cushion Car Wheel Co., Indianapolis.
Davenport & Fairbairn, Erie, Pa.
Detroit Car-Wheel Co., Detroit, Mich.
Dickson Car Wheel Co., Houston, Tex.
C. G. Eckstein & Co., 32 Liberty St., N. Y.
Jersey City Wheel & Mach. Works,
Lima Machine Works, Lima, O.
Lodell Car-Wheel Co., Wilmington, Del.
Louis Car-Wheel Co., Louisville, Ky.
Michigan Car Co., Detroit, Mich.
N. Y. Car Wheel Works, Buffalo.
Thos. Prosser & Son, 15 Gold street, N. Y.
Ramapo Wheel & Fdry Co., Ramapo, N. Y.
Stand. Steel Wks., 220 So. 4th St., Phila.
Taylor Iron & Steel Co., High Bridge, N. J.
Washburn Car-Wheel Co., Hartford, Conn.
Wason Mfg. Co., Springfield, Mass.
A. Whitney & Sons, Philadelphia, Pa.
Car Window Balance
Caldwell Mfg. Co., Rochester, N. Y.
O. K. Gardner, Box 171, Pittsburgh, Pa.
Cattle Guards
Kalamazoo R. R. Veloc. & Car Co., Kal-
amazoo, Mich.
National Surface Guard Co., Chicago.
Ceal Chate
Williams, White & Co., Moline, Ill.
Ceal Transferring
C. W. Hunt Co., 48 Broadway, New York.
Consulting Engineers
Thomas Appleton, 305 Rialto Bldg., Chic.
D. J. Barnes, The Rookery, Chicago.
J. J. R. Cross, 18 William St., N. Y.
S. W. Freeseon, World Bldg., N. Y.
W. C. Foster, 32 Broadway, N. Y.
Geo. L. Fowler, 71 Broadway, N. Y.
W. B. Parsons, 35 Broadway, N. Y.
Chas. Paine & Sons, 71 Broadway, N. Y.
P. B. Smith, 222 E. German St., Balto., Md.
Von Schon & Garret, Fredericksburg, Va.
J. A. L. Waddell, Kansas City, Mo.
Wilson Bros. & Co., Philadelphia, Pa.
Consulting Electrical Engineers
Sprague, Duncan & Hutchinson, N. Y.
Copper
Hendricks Bros., 49 Cliff street, N. Y.
Cordage
Samsom Cordage Works, Boston, Mass.
Corrugated Iron
Cincinnati Corrugating Co., Piqua, O.
Cranes
Industrial Works, Bay City, Mich.
John N. Poage, Cincinnati, O.
R. L. Wood & Co., Philadelphia, Pa.
Yale & Towne Mfg. Co., Stamford, Conn.
Crosscutting
Crescent Lumber & Construction Co.,
Fernandina, Fla.
Lehigh Valley Creos. Wks., P. Amboy, N. J.

Crossings
American Supply Co., Kansas City, Mo.
Pontiac Crossing Co., Detroit, Mich.
Crossing Gates
Bogue & Mills Mfg. Co., Chicago.
Culvert Pipe
Blackmer & Post, St. Louis, Mo.
Cupolas
Byram & Co., Detroit, Mich.
De-Frapping
Norton Door Check & Spring Co., Boston.
Draft Riggers
Schoen Mfg. Co., Pittsburgh, Pa.
Drybar Attachment
Alder, Cont. Draw-Bar Co., Aurora, Ind.
American Steel Wheel Co., N. Y. City.
Butler Drawbar Attach. Co., Cleveland.
Dressing Machinery
Bucyrus (O.) Steam Shovel & Dredge Co.,
San Francisco Bridge Co., California.
Vulcan Iron Works, Chicago.
Vulcan Iron Works, Co., Toledo.
Drop Forgings
Billings & Spencer Co., Hartford, Conn.
Electric Crossing Signal
Electric Supply & Mfg. Co., Cleveland, O.
Electric Headlights
Nat. Elect. Headlight Co., Indianapolis.
Electric Motors
Thomson-Houston Motor Co., Boston.
Electric Railways
Thomson-Houston Electric Co., Boston.
Emergency
Belt & Packing Co., 15 Park Row.
Northampton Emery W. Co., Leeds, Mass.
Springfield Emery W. Mfg. Co., Bridge-
port, Conn.
Tanite Co.
Stroudsburg, Pa.
Engineering Instruments
Chas. H. Brightly, Philadelphia, Pa.
Heller & Brightly, Philadelphia, Pa.
C. F. Ketcham & Co., 27 Nassau St., N. Y.
Keuffel & Esser, New York City.
Queen & Co., Philadelphia, Pa.
Young & Sons, Philadelphia, Pa.
Engines
Fishkill Landing Mch. Co., Fishkill, N. Y.
Labe & Bodley Co., Cincinnati, O.
Philadelphia Engineering Wks., Phila.
Westinghouse Machine Co., Pittsburgh.
Excavators
Bucyrus (O.) Steam Shovel & Dredge Co.,
Industrial Works, Bay City, Mich.
A. S. Males & Co., Cincinnati, O.
Marion Steam Shovel Co., Marion, O.
Osgood Dredge Company, Albany, N. Y.
J. Souther & Co., Boston, Mass.
Vulcan Iron Works, Chicago.
Vulcan Iron Works, Co., Toledo.
Explosives
Rednick Powder Co., 22 Park Place, N. Y.
Feed-Water Purifier
Field Water Purifier Co., Chicago.
Flexible Shafting
Stow Flexible Shaft Co., Phila., Pa.
Stow Mfg. Co.
Binghamton, N. Y.
Freight Cars, Second Hand
New York Equip. Co., 15 Wall St., N. Y.
Freight Conveyors
Industrial Works, Bay City, Mich.
Forces
The Voss Mfg. Co., Springfield, O.
Frogs and Crossings
American Supply Co., Kansas City, Mo.
Cleveland (O.) Frog & Crossing Co.
Elliot Frog & Sw. Co., E. St. Louis, Ill.
Johnston R. R. Frog & Switch Co., Phila.
Pennsylvania Steel Co., Steelton, Pa.
Ramapo Iron Works, Ellensburg, N. Y.
Union Switch & Signal Co., Pittsburgh.
Weir Frog Co., Cincinnati, O.
Furnaces
Bendroft & Root M. Co., 28 Cliff St., N. Y.
Byram & Co., Detroit, Mich.

Gauges (Pressure)
Anderson Mfg. Co., 11 Liberty St., N. Y.
Grader, Ditcher & R. R. Builder
F. C. Austin Mfg. Co., Chicago, Ill.
Guarantee Co.
Guarantee Co. of N. A., Montreal.
Hand Cars
The Buda Ry. & Mfg. Co., Harvey, Ill.
Fairbanks, Morse & Co., Chicago.
Kalamazoo (Mich.) R. R. Veloc. Co.
Shelfield Velociped Car Co., Three
Rivers, Mich.
Harbor Works
S. W. Freeseon, World Bldg., N. Y.
Highway Crossing Signals
Electric Supply & Mfg. Co., Cleveland, O.
Hoisting Engines
Copeland & Bacon, New York City.
Industrial Works, Bay City, Mich.
Lidgerwood Mfg. Co., 96 Liberty St., N. Y.
J. R. Mundy, Newark, N. J.
Vulcan Iron Works, Chicago.
Hollow Stay Bolt Iron
Falls Hollow Stay Bolt Co., Cuyahoga
Falls, O.
Hydraulic Jacks
Richard Dugdon, 34 Columbia St., N. Y.
Joseph F. McCoy Co., 25 Warren St., N. Y.
Watson & Stillman, 210 E. 43d St., N. Y.
Hydraulic Machinery
Finlay Olsen & Co., Philadelphia, Pa.
Union Iron Works, San Francisco.
Watson & Stillman, N. Y. City.
R. D. Wood & Co., Philadelphia, Pa.
Inspectors of Bridges and Ry.
Equipment
E. W. Hildreth & Co., 2 Wall St., N. Y.
Insurance
Hart. Steam Boiler Insp. & Ins. Co.,
Hartford.
Royal Ins. Co., 20 Wall street, N. Y.
Interlocking Switches & Signals
Allentown Rolling Mills, Allentown, Pa.
Hall Signal Co., 50 E'way, N. Y.
Kelsey B. R. Signal Co., Florence, Mass.
Nat. Switch & Signal Co., So. Bethle-
hem, Pa.
Union Switch & Signal Co., Pittsburgh.
Wharton R. R. Switch Co., Phila.
Iron-Taylor Yorkshire
B. M. Jones & Co., Boston, Mass.
Iron Work for Contractors
Edge Moor Bridge Works, Wilmington,
Del.
Iron & Steel Ship Builders
Union Iron Works, San Francisco.
Injectors
Nathan Mfg. Co., 64 Liberty street, N. Y.
Wm. Sellers & Co., Philadelphia.
Jacks
Fairbanks, Morse & Co., Chicago.
McCherry Mfg. Co., Dayton, O.
Richard Dugdon, 34 Columbia St., N. Y.
Watson & Stillman, 210 E. 43d St., N. Y.
Journal Bearings
Ajax Metal Co., Philadelphia, Pa.
Deoxidized Metal Co., Bridgeport, Conn.
D. A. Hopkins Mfg. Co., 118 Liberty St.,
N. Y.
Phosphor-Bronze Smelting Co., Phila.
Paul S. Reeves, Philadelphia, Pa.
Journals-Bog Lids
Ramapo (N. Y.) Wheel & Fdry Co.
Lighting
Adams & Westlake Co., Chicago.
Railroad Lighting & Mfg. Co., Phila., Pa.
Safety Car Heat. & Light Co., 190 E'way,
N. Y.
Lock Washers
Nat. Lock Washer Co., Newark, N. J.
Locomotives
American Supply Co., Kansas City, Mo.
Baldwin Locomotive Works, Phila.
Brooks Locomotive Wks., Dunkirk, N. Y.
Cooke Loco. & Mach. Co., Paterson, N. J.
Dickson Mfg. Co., Scranton, Pa.

NEW, REVISED, ENLARGED EDITION

—OF—

THE TRAIN WIRE,

A DISCUSSION OF THE SCIENCE OF TRAIN DISPATCHING.

BY

J. A. ANDERSON, OF THE PENNSYLVANIA RAILROAD.

WITH AN INTRODUCTION BY

B. B. ADAMS, Jr., of the RAILROAD GAZETTE.

152 pages (5 x 7 1/2 in.). Price \$1.25.

The first eight chapters are discussions of the general principles, and treat of: **Train Dispatching, The Dispatcher, The Operator, The Order (with photographic illustrations of very good and very bad manuscripts), The Manifest, The Record, The Train-Order Signal, The Transmission.**

Chapter Nine contains the standard code of rules for the movement of trains by telegraphic orders, with comments on each rule, giving valuable practical advice as to its application in special cases, and making its purpose and necessity clear.

Chapter Ten contains the standard forms of train orders, and the remaining chapters treat of rules as to rights of track, numbering switches, etc.

The book is complete and exhaustive as a practical handbook and course of instruction for an inexperienced operator, and there are few superintendents or dispatchers who may not learn much from Mr. Anderson's long experience in this department. He is probably the best authority in the world on train dispatching.

PUBLISHED AND FOR SALE BY

The RAILROAD GAZETTE, 73 Broadway, New York

Malleable-Iron, Cast-Iron, Wrought-Iron and Steel Fittings

FOR WROUGHT-IRON PIPE. Keystone Soft-Metal Union.

Ready for immediate use. Requires no washer. Can be made tight with but little pressure.



DROP FORGED FROM THE VERY BEST
STEEL FOR THE PURPOSE.

STANLEY G. FLAGG & CO.,

Nineteenth St., Penna. Ave. and Hamilton St., Philadelphia, Pa.



MANUFACTURERS OF STEEL AIR-BRAKE FITTINGS.

Guaranteed air-tight, threads full and sharp, made from templates to standard gauge.

SPECIFY FLAGG STEEL FITTINGS FOR AIR-BRAKE CONNECTIONS.

BILLINGS.

DOUBLE-ACTING RATCHET DRILLS.

The entire satisfaction which these drills have given in the many years they have been before the public is a guarantee of their excellence.

THE BILLINGS & SPENCER CO.,

HARTFORD, CONN.

RAILROAD GAZETTE DIRECTORY CLASSIFIED ADVERTISEMENTS.

Locomotives (Continued)
G. L. Fowler, 33 Broadway, N. Y.
Lima Machine Works, Lima, O.
A. S. Males & Co., Cincinnati, O.
N. Y. Equipment Co., 15 Wall St., N. Y.
Pittsburgh Loco. & Car Wks., Pittsburgh, Pa.
H. E. Porter & Co., Pittsburgh, Pa.
Richmond (Va.) Loco. & Mach. Works, Richmond, Va.
Rogers Loco. & Mach. Wks., Paterson, N. J.
Schinectady (N. Y.) Loco. Works, Schinectady, N. Y.
Tait & Carlton, London, Eng.
Wharton R. R. Switch Co., Phila.
Locomotive Finishing
Flood & Conklin, Newark, N. J.
Locomotive Headlights
Adams & Westlake Co., Chicago.
Nat. Elect. Headlight Co., Indianapolis.
Locomotives, Second-Hand
Residual Contracting Co., 115 E. 12th St., N. Y.
A. S. Males & Co., Cincinnati, O.
N. Y. Equipment Co., 15 Wall St., N. Y.
Locomotive Staybolt Iron
Falls Hollow Staybolt Co., Cuyahoga Falls, O.
Lubricators
American Supply Co., Kansas City, Mo.
Nathan Mfg. Co., 92 Liberty street, N. Y.
Machinery Tools
Acme Machy. Co., Cleveland, O.
Bement, Miles & Co., Philadelphia, Pa.
Billings & Spencer Co., Hartford, Conn.
E. W. Bliss Co., Brooklyn, N. Y.
Brown & Sharpe Mfg. Co., Providence, R. I.
Fennell Machine Co., Bridgeport, Conn.
Gould & Eberhardt, Newark, N. J.
Edw. Harrington, Son & Co., Phila.
Hayes Tool Co., Portland, Me.
Lutz & Alstetter Co., Hamilton, O.
Manning, Max. & Moore, 111 Liberty St., New York, N. Y.
Morse Tr. Dr. & Mach. Co., N. Bedford, Mass.
Newark Mach. Tool Wks., Newark, N. J.
Niles Tool Works, Hamilton, O.
Pedrick & Ayer, Philadelphia, Pa.
Geo. Paine, 120 Broadway, N. Y.
D. Saunders' Sons, Yonkers, N. Y.
Wm. Sellers & Co., Philadelphia, Pa.
Stiles & Parker Press Co., Middletown, Conn.
Power Flexible Shaft Co., Phila., Pa.
Stow Mfg. Co., Birmingham, N. Y.
Universal Radial Drill Co., Cincinnati, O.
Watson & Stillman, 70 E. 43d St., N. Y.
Wharton R. R. Switch Co., Phila.
Malleable Iron Castings
National Malleable Castings Co., Cleveland, Ohio.
Mandrel Rolled Staybolt Iron
Falls Hollow Staybolt Co., Cuyahoga Falls, O.
Mining Machinery
Lidgerwood Mfg. Co., 96 Liberty St., N. Y.
Iron Works, San Francisco.
Map Wringer
Boston Wringer Co., Boston.
Nut Locks
American Supply Co., Kansas City, Mo.
Amer. Washer & Mfg. Co., Newark, N. J.
Metzger, Paul & Co., Pittsburgh, Pa.
National Lock Washer Co., Newark, N. J.
Ruffner & Dunn, Philadelphia, Pa.
Standard Nut Lock Co., N. Y.
Oil Cans
Adams & Westlake Co., Chicago.
Bryant & Barbery, 79 Milk St., Boston.
H. A. Williams Mfg. Co., Boston.
Oil
Signal Oil Works, Ltd., Franklin, Pa.

Packing, Asbestos
H. W. Johns Mfg. Co., N. Y. City.
Packing-Rubber
N. Y. Belting & Pack. Co., N. Y. City.
Paint
Address Paint & Color Co., 15 Cortlandt street, N. Y.
F. W. Devos & Co., Fulton St., N. Y.
Jos. Dixon Crucible Co., Jersey City, N. J.
Warren Chemical & Mfg. Co., N. Y. City.
Patents
Howson & Howson, 115 So. 4th St., Phila.
Geo. P. Whittlesey, Washington, D. C.
Phosphor-Bronze
Paul S. Reeves, Philadelphia.
Phosphor-Bronze Smelting Co., Phila.
Piling
American Supply Co., Kansas City, Mo.
Pile Drivers
Bucyrus (C.) Steam Shovel & Dredge Co., Industrial Works, Bay City, Mich.
Lidgerwood Mfg. Co., 96 Liberty St., N. Y.
Pulcan Iron Works, Chicago, Ill.
Pipe Cutting & Threading Mach.
D. Saunders' Sons, Yonkers, N. Y.
Pneumatic Foundations
S. W. Prescott, World Bldg., N. Y.
Portable Drills
Frank Reed, Worcester, Mass.
Stow Flexible Shaft Co., Phila., Pa.
Stow Mfg. Co., Birmingham, N. Y.
Pressed Steel
Schoen Mfg. Co., Pittsburgh, Pa.
Valley Blocks
Boston & Lockport Block Co., Boston.
Pumps
Fairbanks, Morse & Co., Chicago.
Laidlaw & Dunn Co., Cincinnati, O.
Valley Pump Co., Easthampton, Mass.
E. D. Wood & Co., Philadelphia, Pa.
H. R. Worthington, 86 Liberty St., N. Y.
Rail-Taps
J. T. Connelly, Milton, Pa.
Rails
American Supply Co., Kansas City, Mo.
Bethlehem Iron Co., 90 Broadway, N. Y.
Cambria Iron Co., Johnstown, Pa.
N. Y. Child & Co., 115 Broadway, N. Y.
Geo. A. Evans, 40 and 42 Wall St., N. Y.
Humphreys & Sayce, 10 Wall St., N. Y.
Illinois Steel Co., Chicago, Ill.
A. S. Males & Co., Cincinnati, O.
N. Y. Equipment Co., 15 Wall St., N. Y.
Pennsylvania Steel Co., 2 Wall St., N. Y.
Robinson & Orr, Pittsburgh, Pa.
A. S. Whiton, 115 Broadway, N. Y.
Rail Fastenings
American Supply Co., Kansas City, Mo.
Cambria Iron Co., Johnstown, Pa.
Fisher Rail-Joint Works, Trenton, N. J.
A. S. Males & Co., Cincinnati, O.
Metzger, Paul & Co., Pittsburgh, Pa.
National Lock Washer Co., Newark, N. J.
N. Y. Equipment Co., 15 Wall St., N. Y.
Morris Sellers & Co., Chicago.
Ruffner & Dunn, Philadelphia, Pa.
Rail Saws
Bryant & Barbery, 79 Milk St., Boston.
Industrial Works, Bay City, Mich.
Railroad and Transp. Lines
Bik Four.
Boston & Albany.
Chicago & Alton.
Chicago, Burlington & Quincy.
Chicago, Milwaukee & St. Paul.
Chicago & Northwestern.

Chicago, Rock Isl. & Pacific.
C. H. & D.
Hoose Tunnel Route.
Illinois Central.
Lehigh Valley R. R.
Michigan Central.
Missouri Pacific.
New York Central & Hudson River.
New York, Lake Erie & Western.
New York & New England R. R.
Pennsylvania.
Stonington Line.
Railroad Printing
W. H. Campbell, 18 Union Sq., N. Y. City.
C. F. Ketcham & Co., 27 Nassau St., N. Y.
Railroad Supplies
American Supply Co., Kansas City, Mo.
Bryant & Barbery, 79 Milk St., Boston.
Residual Contracting Co., 115 E. 12th St., N. Y.
O. W. Child & Co., 115 Broadway, N. Y.
Fairbanks, Morse & Co., Chicago.
S. S. Greeley & Co., 7 Day St., N. Y.
Intern. Ry. Equipment & Supply Co., N. Y.
The Johnson & R. Signal Co., Rahway, N. J.
A. S. Males & Co., Cincinnati, O.
N. Y. Equipment Co., 15 Wall St., N. Y.
N. Y. Railway Supply Co., 40 Wall St.
G. D. Peters & Co., London, England.
A. T. Shoemaker, Chicago and N. Y.
Railway Equipment
American Supply Co., Kansas City, Mo.
Railway Varieties & Surfaces
Flood & Conklin, Newark, N. J.
Ratchet Drills
Billings & Spencer Co., Hartford, Conn.
Schuttler Mfg. Co., Chicago.
Reducing Valves
Curtis Regal Co., 9 Beverly St., Boston.
Mason Regulator Co., Boston, Mass.
Refrigerator Cars
R. M. Hancock, Camden, N. J.
So. & Pac. Refrigerator Car Co., Chicago.
Refrigerating Machinery
De La Vergne Refrig. Machine Co., N. Y.
Rivers, Slotted
J. A. Thomson Mfg. Co., Waltham, Mass.
Rock Ballast and Rock Breakers
Rock Ballast Works, Chicago, Ill.
Rock Drills
Ingersoll-Sergeant Rock Drill Co., N. Y.
Rand Drill Co., 25 Park Place, New York.
Reels
Berlin Iron Bridge Co., E. Berlin, Conn.
Cincinnati Corrugating Co., Piqua, O.
Oliver Adams, Liberty St., N. Y.
Rubber Belting
N. Y. Belting & Pack. Co., 15 Park Row.
Safety Valves
Ashton Valve Co., Boston, Mass.
Saw Mills
Richmond (Va.) Loco. & Mach. Wks.
Second-Hand Rail & Steel Stock.
American Supply Co., Kansas City, Mo.
A. S. Males & Co., Cincinnati, O.
Sewer Pipes
Blackmer & Post, St. Louis, Mo.
R. D. Wood & Co., Philadelphia, Pa.
Sewerage
J. J. R. Croes, 13 William St., N. Y.
Wm. Sellers & Co., Phila.
Signals
Hall Signal Co., 30 Broadway, N. Y.
Johnson R. R. Signal Co., Rahway, N. J.

Kelsey R. R. Signal Co., Florence, Mass.
Nat. Switch & Signal Co., So. Bethlehem, Pa.
Union Switch & Signal Co., Pittsburgh, Pa.
Skylights
Valley & Young, 39 No. St. Baltimore, Md.
E. Van Noorden & Co., Boston.
Snow Shovels and Plows
Jull Mfg. Co., Brooklyn.
Leslie Bros. Mfg. Co., Paterson, N. J.
Solid Staybolt Iron
Falls Hollow Staybolt Co., Cuyahoga Falls, O.
Spikes
American Supply Co., Kansas City, Mo.
Dillworth, Porter & Co., Pittsburgh, Pa.
Q. & C. Co., Chicago.
Morris Sellers & Co., Chicago.
Springs
Atkinson Steel & Spring Works, Chicago, Ill.
Farist Steel Co., Bridgeport, Conn.
A. French Spring Co., Pittsburgh, Pa.
Pickering Spring Co., Philadelphia, Pa.
Chas. Scott Spring Co., Philadelphia, Pa.
Stand Pipes
John N. Pogue, Cincinnati, O.
Sheffield Veloc. Car Co., Three Rivers, Mich.
Staybolt Iron
Falls Hollow Staybolt Co., Cuyahoga Falls, O.
Fuller Bros. Co., N. Y.
R. M. Jones & Co., Boston & N. Y.
Steam Coupling
Moran Flex. Steam Joint Co., Louisville, Ky.
Steel Car Channels
Cambria Iron Co., Johnstown, Pa.
Steel-Musket's
E. M. Jones & Co., 11 Oliver St., Boston.
Steel Castings
Chester Steel Castings Co., Philad., Pa.
Eureka Cast Steel Co., Philad., Pa.
Sharon Steel Castings Co., Sharon, Pa.
Solid Steel Co., Alliance, O.
Pratt & Letchworth, Buffalo, N. Y.
Steel Centre Plates
Schoen Mfg. Co., Pittsburgh, Pa.
Steel and Iron Plates
Lukens Iron & Steel Co., Coatesville, Pa.
Steel and Steel Tires
Midvale Steel Co., Flinton, Phila.
Lafayette Steel Works, La Roche, Pa.
Thos. Prosser & Son, 15 Gold St., N. Y.
Standard Steel Works, Philadelphia, Pa.
Storage of Ry. Equipment
New Jersey Car Storage & Repair Co., Lake View, N. J.
Switches and Switch Stands
Blount Rolling Mill, Allentown, Pa.
Elliott Frog & Switch Co., St. Louis, Ill.
Johnston R. R. Frog & Switch Co., Pa.
Kelsey R. R. Signal Co., Florence, Mass.
Nat. Switch & Signal Co., So. Bethlehem, Pa.
Pennsylvania Steel Co., Steelton, Pa.
Ramapo Iron Works, Ramapo, N. Y.
Sheffield Veloc. Car Co., Three Rivers, Mich.
Union Switch & Sig. Co., Pittsburgh, Pa.
Weir Frog Co., Cincinnati, O.
Tanks (Cedar).
G. I. Burkhardt's Sons, Philadelphia, Pa.
Fairbanks, Morse & Co., Chicago.
Tank Valves
John N. Pogue, Cincinnati, O.

Taps and Dies
Manning, Maxwell & Moore, 111 Lib. St., N. Y.
D. Saunders' Sons, Yonkers, N. Y.
Testing Laboratory
Fitts Testing Laboratory, Pittsburgh, Pa.
Telegraph Cables
Electric Secret Service Co., N. Y. City.
Gill-Alexander Electric Mfg. Co., Kansas City, Mo.
Thermometers
Standard Therm. Co., Peabody, Mass.
Tie Plates
Q. & C. Co., Chicago.
Shoulder Tie Plate Co., Philadelphia, Pa.
Track Tools
Metzger, Paul & Co., Pittsburgh, Pa.
Transfer Tables
Industrial Works, Bay City, Mich.
Trucks and Express Warrors
Boston & Lockport Block Co., Boston.
Turn Buckles
Central Iron & Steel Co., Brazil, Ind.
Cleveland City Forge & Iron Co., Cleveland, O.
Turn Tables for Railways
Corford & Savor, Philadelphia, Pa.
Industrial Works, Bay City, Mich.
A. S. Males & Co., Cincinnati, O.
Passaic Rolling Mill Co., Paterson, N. J.
Wm. Sellers & Co., Phila. and N. Y.
Shaffer Bridge Co., Pittsburgh, Pa.
Valves
Ashton Valve Co., Boston.
Curtis Regulator Co., Boston.
Ludlow Valve Mfg. Co., Troy, N. Y.
Mason Regulator Co., Boston, Mass.
Rose Valve Co., Troy, N. Y.
R. D. Woods & Co., Philadelphia, Pa.
Varieties
F. W. Devos & Co., Fulton street, N. Y.
Murphy & Co., Newark, N. J.
Edw. Smith & Co., Times Bldg., N. Y.
Ventilators
Q. & C. Co., Chicago.
E. Van Noorden & Co., Boston.
Pancoast, R. M., Camden, N. J.
Perry Ventilator Co., 115 E. 12th St., N. Y.
Washers and Rivets
Fulmer Bros. & Co., 139 Greenwich St., N. Y.
Water Columns
J. N. Pogue, Cincinnati, O.
Sheffield Veloc. Car Co., Three Rivers, Mich.
Water Supply
J. J. R. Croes, 13 William St., N. Y.
Wells and Well Tube
The Cook Well Co., St. Louis, Mo.
Window Sash Card
Samson Cordage Works, Boston, Mass.
Wire, Insulated
International Okonite Co. (Ltd.), N. Y.
Wire Rope
Trenton Iron Co., Trenton, N. J.
Wood Working Machinery
Berry & Orton Co., Philadelphia, Pa.
Egan Co., Cincinnati, O.
J. A. Fay & Co., Cincinnati, O.
Greenlee Bros. & Co., Chicago.
John A. White Co., Dover, N. H.
Wrecking Cars
Bucyrus Steam Shovel & Dredge Co., Bucyrus, O.
Industrial Works, Bay City, Mich.
Wrenches
Billings & Spencer Co., Hartford, Conn.
Roos Island Tool Co., Providence.



MORAN FLEXIBLE STEAM JOINT CO.,

HENRY U. FRANKEL, President, 149 Third St. Louisville, Ky.

ALL-METAL REVERSIBLE PISTON COUPLING. NO HOSE. USED IN CONNECTION WITH FLEXIBLE BALL JOINTS. APPLICABLE TO EVERY SYSTEM OF STEAM HEATING.

FOR CONVEYING STEAM FROM COACH TO COACH. BLUEPRINTS AND JOINTS ON APPLICATION.

THE AMERICAN WASHER & MANUFACTURING CO.,

13 & 15 RAILROAD PLACE, NEWARK, N. J.

EDWIN W. HINE, President.

L. L. STURGES, Secretary and Treasurer.

H. A. HARVEY, Vice-President.

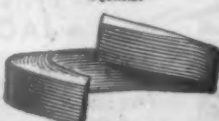
THE AMERICAN "HARVEY RIBBED" NUT LOCK

A Resilient Spiral Spring Washer with Ratchet-Shaped Teeth.

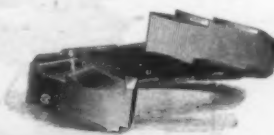
Patented.

The American Harvey No. 1 Nut Lock, a resilient spring washer with chisel cutting edges. Patented. Tempered in oil.

SQUARE.



The American "No. 2 Square" Plain Spring, answers the purpose of all ordinary spring washers. Above pattern made of either round or square steel. Tempered in oil.



Our claim for this lock, aside from the unexcelled spring quality it possesses (being tempered in oil) is the tangential cutting or ratchet ribs on either side, and so curved, so that when the nut is set down these ribs are embedded in both fish plate and under face of nut to such extent that a removal of the nut by force (and it can only be done with force) will show annular grooves plowed on surface of both nut and fish plate (see cuts above) without disturbing the thread of either nut or bolt, both of which, together with the nut lock, can be used again. This is a positive lock, with spring temper, and will not cut thread of nut or bolt.

CORRESPONDENCE AND ORDERS SOLICITED. SAMPLES FURNISHED FREE ON APPLICATION AND SENT TO ANY ADDRESS.

W. H. DOANE, Pres.

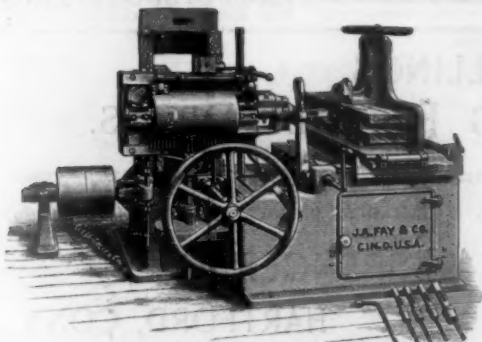
D. L. LYON, Sec'y.

J. A. FAY & CO.,

CINCINNATI, O., U. S. A.

CAN FURNISH

Car, Locomotive and Railway Shops



Complete Equipments

-OF-

WOOD-
WORKING
MACHINERY.

No. 3 New Improved Hollow Chisel Car Mortiser.

AWARDED

'Grand Prix,' Universal Exposition, Paris, 1889.

4 GOLD AND SILVER MEDALS AT

Chicago Railway Exposition of 1883.

Catalogues and
Estimates Furnished
upon Application.



ACME MACHINERY CO.,

CLEVELAND, OHIO,

Manufacturers of

ACME BOLT & RIVET HEADERS

Acme Single & Double Automatic Bolt Cutters

Cutting from 1/4 in. to 6 in. diam.

Also SEPARATE HEADS AND DISS.

First Premium Cincinnati Centennial



Pat. Dec. 3, '82
Pat. Dec. 1, '83
Pat. Aug. 25, '85

MORSE
TWIST DRILL & MACHINE CO.
MANUFACTURERS OF
Patent Machine Relieved Nut and
Hand Taps,
Suitable for use in Railroad, Car and Locomotive shops. We keep in stock a full line of U. S. or Franklin-Institute Standard Taps; also, V and Whitworth Threads also Pipe Taps, Pipe Reamers and Pipe Stocks, Dies, and Bushing

EVERY TOOL WARRANTED.

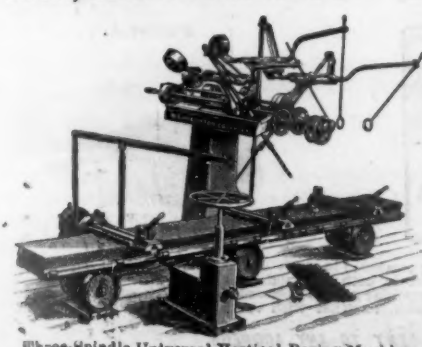
MANNING, MAXWELL & MOORE,
SOLE SELLING AGENTS,
111 LIBERTY STREET
NEW YORK.

Morse Twist Drill & Mch. Co.
Established 1864. New Bedford, Mass.
Manufacturers of Drills
for Metal or Wood,
Beach Chucks, Cutters, Reamers, Taps, Dies,
Grinding Machines, and Special Tools.

CATALOGUES MAILED ON REQUEST

BERRY & ORTON CO.,

ATLANTIC WORKS,
Twenty-Second above Arch St., PHILADELPHIA, PA.



Designers and Manufacturers of
**Machinery
for Working
Wood.**

Car Builders' Tools a Specialty.

Drawings and Estimates furnished upon application.

BEMENT, MILES & CO.

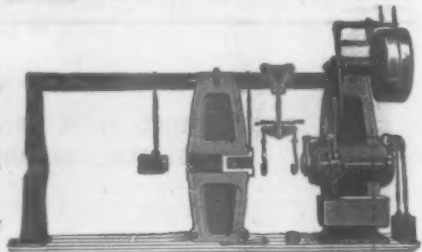
PHILADELPHIA, PA.,

-BUILDERS OF-

METAL-WORKING MACHINE TOOLS

For Railroad Shops, Locomotive and Car Builders, Machine Shops, Steam Forges, Ship Yards, Boiler Shops, Bridge Works, etc.

Steam Hammers for Working Iron or Steel.



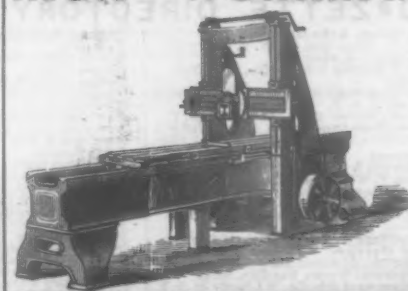
Established 1867.

EDWIN HARRINGTON, SON & COMPANY.

Works and Office: Cor. N. 15th St. & Penn Ave., Philadelphia, Pa., U.S.A.

MANUFACTURERS OF A FULL LINE OF

IRON WORKING MACHINERY



Including Extension and Gap Lathes, Planers with Quick Return, Drills, etc., Hand Power Elevators with Patent Brake, Double Chain Screw Hoists, Overhead Tramway with Switch, Turntable and Geared Truck.

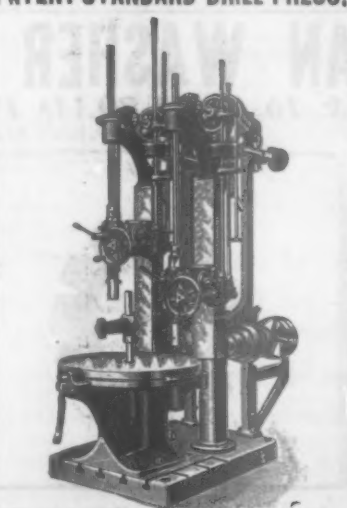
SEND FOR ESTIMATES.

GEAR CUTTING A SPECIALTY.

Greenlee Bros. & Co.
SPECIAL
WOOD WORKING
MACHINERY.
SEND FOR DESCRIPTION OF OUR NEW
AUTOMATIC CAR MORTISERS, AND FOUR SPINDLE CAR GAINER BORING MACHINE.
DOUBLE CUT-OFF MACHINE
CHICAGO.

LUDLOW VALVE MFG. CO.
OFFICE AND WORKS
935 to 954 River Street, and 67 to 83 Van Avenue, Troy, N. Y.
VALVES
(Double and Single Gate, 1/4 in. to 48 in.—Outside and Inside Screws, Indicator, etc.), for Gas, Water and Steam. Send for circular.
ALSO, FIRE HYDRANTS.

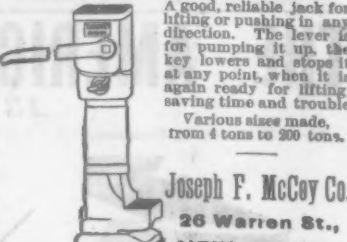
EBERHARDT'S PATENT STANDARD DRILL PRESS.



DUPLIX DRILL, 25, 32, 37, 43, 48, 53 in. sizes.

GOULD & EBERHARDT,
Near Market St. Depot,
NEWARK, N. J.

TANGYE'S HYDRAULIC LIFTING JACK.



A good, reliable Jack for lifting or pushing in any direction. The lever is for pumping it up, the key lowers and stops it at any point, when it is again ready for lifting, saving time and trouble. Various sizes made, from 4 tons to 200 tons.

Joseph F. McCoy Co.
26 Warren St.,
NEW YORK.

RICHARD DUDGEON
24 COLUMBIA ST., NEW YORK.
Maker and Patentee of
Improved Hydraulic JACKS
PUNCHES,
BOILER-
TUBE EXPANDERS AND
DIRECT-ACTING
Steam Hammers.
Communications by letter will receive prompt attention.
Jacks for Pressing on Car Wheels or Crank Pins made to order.

PATENT PORTABLE STEAM CHEST SEAT MILLING MACHINE.

THIS machine is the only one ever built to supersede the slow and expensive operation of cutting a groove in the surfaces joining the steam chest seat with hammer, chisel and file. It will do the work perfectly by hand or power in one quarter of the time now required, and without skilled labor. It is also adapted to the drilling out of old studs when broken off, and for milling out the ports on new work, or for repairing same when eaten away.

For Circulars and Prices Address

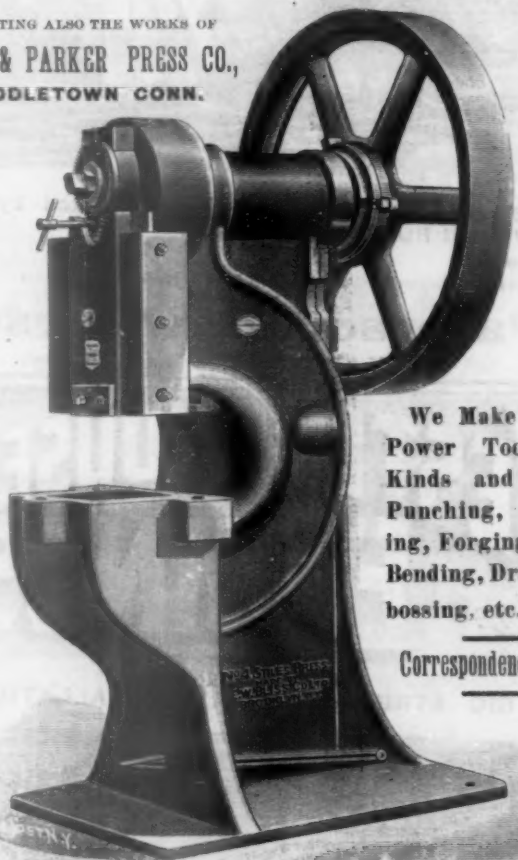
PEDRICK & AYER,

1001 & 1003 Hamilton Street, Philadelphia, Pa.

E. W. BLISS CO., LTD.,

6 ADAMS ST., BROOKLYN, N. Y.

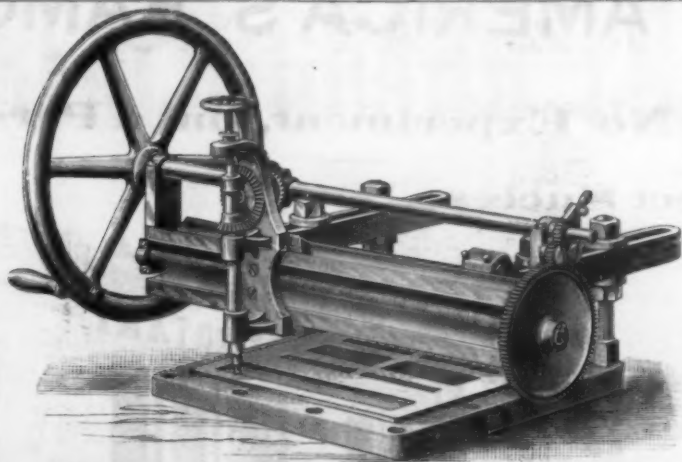
OPERATING ALSO THE WORKS OF
STILES & PARKER PRESS CO.,
MIDDLETOWN CONN.



We Make Foot and Power Tools of All Kinds and Sizes for Punching, Perforating, Forging, Shaping, Bending, Drawing, Embossing, etc.

Correspondence Solicited.

PUNCHES AND SHEARS, PRESSES, DROP HAMMERS AND DIES.



Large Special "PUNCHES" and "SHEARERS" for Bridge and Girder Work, Iron Buildings, etc., etc.



Foot Screw and Drop. Also Cutting, Punching, Forming, Shearing, Embossing, Coining and Drawing

PRESSES

OF ALL SIZES AND KINDS.

DRAWING PRESSES and DIES

For Lanterns, Lamps, Tinware, Brass Goods, etc.

FERRACUTE MACHINE CO

BRIDGETON, N. J., U. S. A.,

Manufacturers of all kinds of Presses, Dies and other Tools for Sheet and Bar Metals.

Please Send for their Illustrated Price Lists, describing 150 kinds of Presses, Lathes, Rolls, Benders, Trimmers, etc.

GATES ROCK AND ORE BREAKER.

Number Sold in 1891 Excels All Former Records.

We Beg to Announce the Following Specialties for 1892:

- A New Fine Crusher to Supplant Rolls
- A New Dry Ore Concentrator—the Card.
- A New Wet Ore Concentrator.
- Improved Cornish Rolls. Simple and Effective
- Grinding Pans, Stamp Mills, Driers.
- All Mining Machinery.

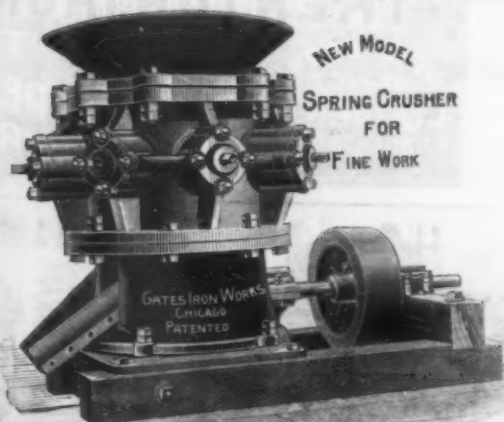
GATES IRON WORKS,

50 S. Clinton St., CHICAGO.

NEW YORK, 136 Liberty St. BOSTON, 218 Franklin St
LONDON, ENG., 73A Queen Victoria St.



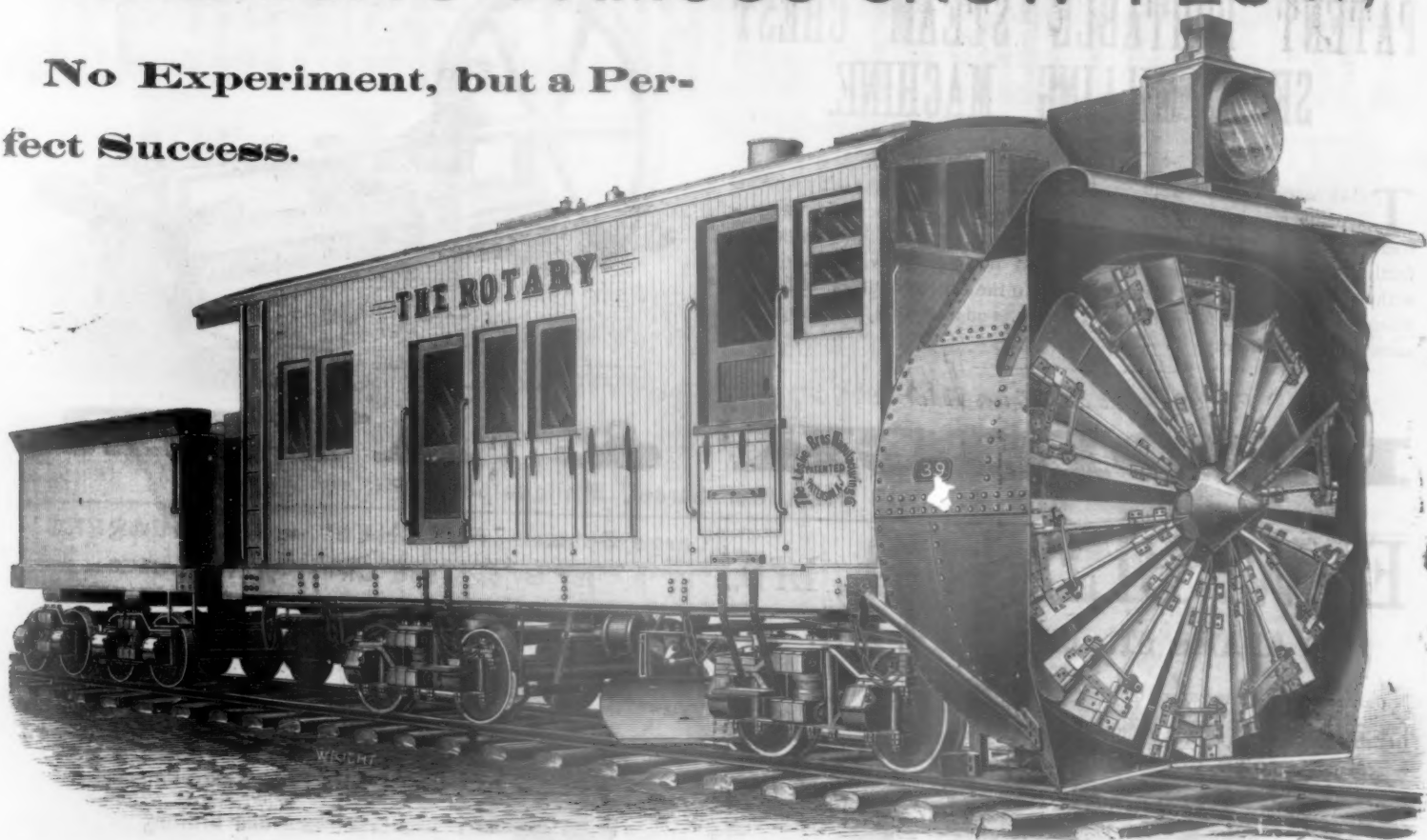
2,500
In Use.



NEW MODEL
SPRING CRUSHER
FOR
FINE WORK

AMERICA'S FAMOUS SNOW PLOW,

No Experiment, but a Perfect Success.



Is acknowledged to be without a RIVAL by the LEADING RAILROADS of AMERICA, and has been adopted by the GOVERNMENT STATE RAILROADS OF GERMANY and RUSSIA in EUROPE.

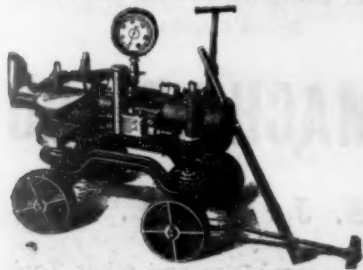
Orders for the Rotary for 1892 should be placed as early as possible to secure prompt and satisfactory delivery. For further particulars address

THE LESLIE BROS. MFG. CO., Paterson, New Jersey.

J. S. LESLIE, President.

M. SWEETNAM, Secretary and Treasurer.

HYDRAULIC PRESSES,



Adjustable Crank Pin Press.

For Forcing Car Wheels,
Crank Pins, &c., &c.

Hydraulic Jacks.

INFERIOR TO NONE.
Largest Variety.

PORTABLE HYDRAULIC PUNCHES

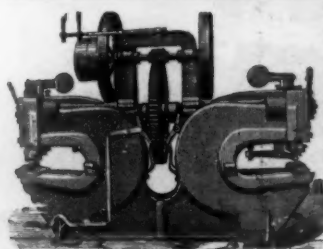
For Bridge and Beam Work.

WATSON & STILLMAN,

210 East Forty-third Street,

New York City.

WIRE ROPE
FOR ALL PURPOSES.
IRON AND STEEL WIRE OF ALL KINDS
TRENTON IRON CO.
TRENTON, N.J.
NEW YORK OFFICE
COOPER HEWITT & CO.
17 BURLING SLIP
WIRE ROPE TRAMWAYS & C

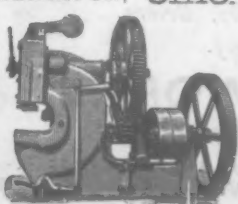


The Long & Allstatter Co., HAMILTON, OHIO.

Double, Single,
Angle Bar, Gang,
Horizontal, Twin,
Boiler, Spacing,
Gate, Multiple,
Belt and Steam-
Driven

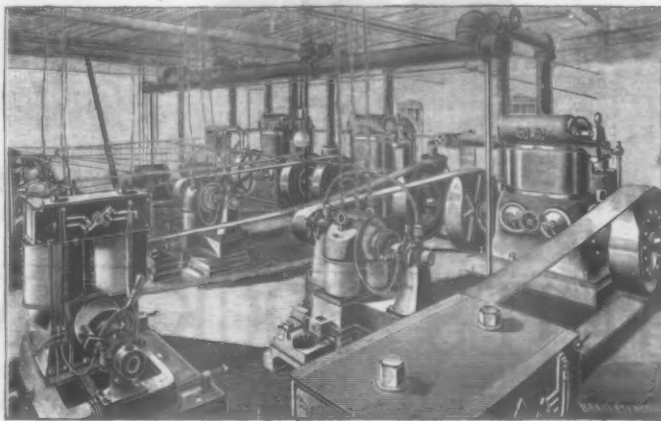
**Punches
& Shears.**

Over 300 Sizes.
Send for New Cat-
alogue.



WESTINGHOUSE ENGINES

ELECTRIC STREET RAILWAY INSTALLATION.



AT OMAHA AND COUNCIL BLUFFS RAILWAY & BRIDGE CO.,
COUNCIL BLUFFS, IOWA.

THE WESTINGHOUSE MACHINE COMPANY.
PITTSBURGH, PENNA. U.S. OF A.

THE CLEVELAND FROG & CROSSING CO.

MANUFACTURERS OF LUCAS' PATENT STEEL FILLED

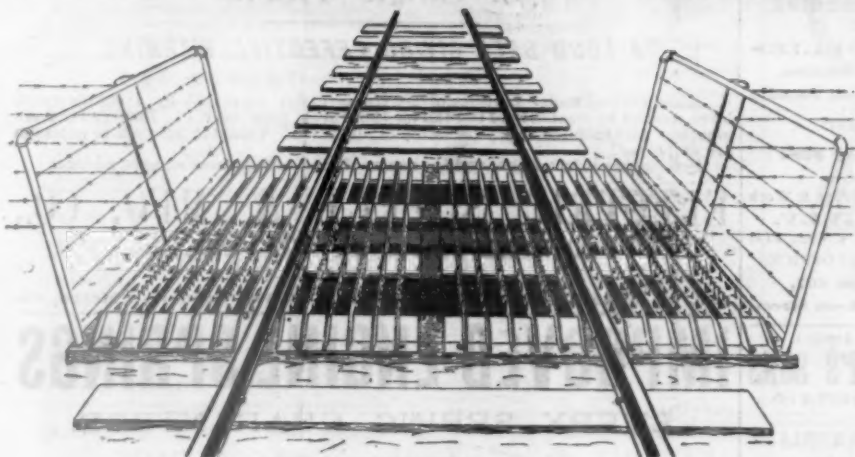
FROGS AND CROSSINGS.

IMPROVED SPRING RAIL FROGS.



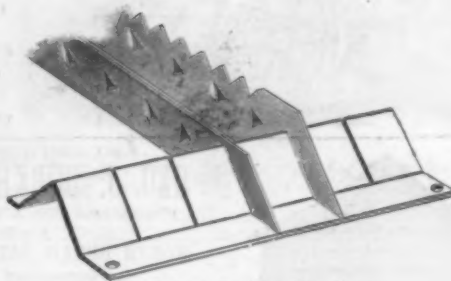
Improved Spring Rail Frogs, Split Switches, Switch
Stands and Track Supplies in General.
N. P. BOWLER, President.
GEO. C. LUCAS, Gen. Mgr.
Office, 14 Winter St., Cleveland, O.

THE NATIONAL SURFACE GUARD CO.



No. 4.

J. T. HALL, Gen. Mgr. and Treas.
T. M. FISH, Vice-Pres. and Sec'y.



Broken Section No. 4.

Manufacturers of Steel Surface Cattle Guards.
13,000 IN USE ON 160 RAILROADS

We Are the Original Manufacturers of Metal Surface Cattle Guards and Owners of
the Twelve Original Patents. The Efficiency of the National Guard
Is Proven by the Number Now in Actual Use.

THE NATIONAL SURFACE GUARD CO.,

E. F. LUCE, General Agent.

445 THE ROOKERY, CHICAGO, U. S. A.

CHICAGO SPLICE BAR MILL.

New England Agents,
SHERBURNE & CO.,
No. 53 Oliver St., Boston.

Morris Sellers & Co.,

OFFICE,
216 Phenix Building,
CHICAGO.

MANUFACTURERS OF THE

New "GREER" Railroad Track Spike and the Celebrated "SAMSON" Bar.

Fourteen years' unexampled success has demonstrated the fact that under all varieties of Railroad Service they will prevent "low joints," battered rail ends, and in a remarkable degree withstand the test of breakage. More than 10,000,000 Bars in use on 160 different Railroads, equivalent to 14,240 miles of track.



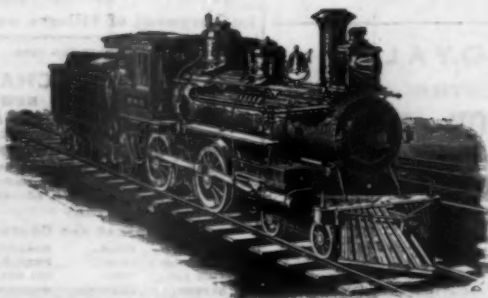
The "Greer" Railroad Track Spike is the latest and best spike offered to the Railroad managements of this country and Great Britain. Indestructible. A holding power of from one to two tons more per spike than any $5\frac{1}{4} \times 9-16$ spike. Automatically sharpened to chisel edge, it cuts; does not tear the wood fiber. Hand packed in kegs—every spike perfect. Particularly adapted for use on Bridges, Trestles, Frogs, Crossings and Switches. SEND FOR TESTS AND PHOTOGRAPHS.

THE FIELD FEED-WATER PURIFIER.

This device will not successfully handle **all waters**, but there are **none** that it will not improve. In a **large majority** it will demonstrate great economy.

The apparatus can be made at railroad shops at small expense.

A trial is solicited at our expense.



Cut showing Purifier Applied to Locomotive.

This water purifier is now in use and on trial on the following railroads:

Wisconsin Central.
Great Northern.
Northern Pacific.
Atchison, Topeka & Santa Fe.
Baltimore & Ohio.

We refer to each of them.

Office: 134 Van Buren Street.

CHICAGO, ILL.

Factory: 43d St. & Stewart Ave.

THE BUDA FOUNDRY & MFG. CO

MANUFACTURERS OF

Wood-Wheel Hand and Push
CARS

WITH ROLLED STEEL TIRE.

RAILWAY SUPPLIES
Switch Stands, Switch Fixtures,
Head Chairs, General Foundry

AND

MACHINE WORK

General Office & Work
**HARVEY,
COOK CO., III.**
CHICAGO OFFICE:
Room 607,
138 Jackson Street.



ESTABLISHED 1840.

GEO. J. BURKHARDT'S SONS

(Successors to GEO. J. BURKHARDT & CO.)

Factory:

NORTH BROAD, BELOW CAMBRIA ST

Near Germantown Junction Station,
Pennsylvania Railroad.

Down Town Office.

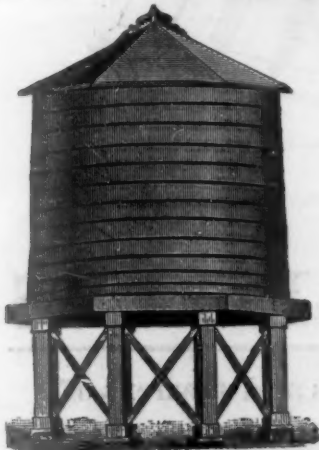
NO. 240 CHESTNUT ST.,
Philadelphia, Pa.

CEDAR TANKS

FOR WATER STATIONS,

From 1,000 to 100,000 Gallons Capacity

A long experience has shown that
CEDAR is the best material for Water
Tanks, being more than twice as dur-
able as Pine, and can be furnished by
us at about the same cost.



477 GENUINE
INGOTS & MANUFACTURES
BEAR OUR
REG. TRADE MARKS.



"Phosphor-Bronze"

PHOSPHOR-BRONZE

INGOTS, CASTINGS, WIRE, SHEET & C.

THE PHOSPHOR BRONZE SMELTING CO. LIMITED

512 ARCH ST. PHILADELPHIA PA. U.S.A.

ORIGINAL MANUFACTURERS OF PHOSPHOR-
BRONZE IN THE UNITED STATES AND SOLE

MAKERS OF "ELEPHANT BRAND" PHOSPHOR-BRONZE.

THE SOLID STEEL CO

ALLIANCE, OHIO.

STEEL CASTINGS

LOCOMOTIVE CASTINGS, SUCH AS
DRIVING BOXES, CROSS HEADS, ROCKER
SHAFTS, PISTONS, FOLLOWERS, etc.

SHAKE SHOES, CAR COUPLERS, DRAW-BARS, ETC.

TAKE THE STONINGTON LINE.

ALL FARES REDUCED.

The Inside Route Between New York and Boston.
Providence, Worcester and all Eastern Points.

Steamers Rhode Island and Narragansett leave New
York from new Pier 36, N. R., one block above Canal St.
at 5.00 P. M., daily, except Sunday, connecting with 3 Ex-
press Trains for Boston. Steamboat Express with Reclin-
ing Chair Cars Free of Charge.

J. W. MILLER, President.

O. H. BRIGGS, G. P. A.



BOSTON WRINGER CO.

MANUFACTURERS,

Office: 79 MILK ST.,

BOSTON MASS.

BRYANT & BARBEY,

RAILROAD SALES AGENTS,

79 MILK ST.,

BOSTON, MASS.



Hottest water
and strongest
lyes can be used,
as hands never
touch the mop.

Light,
Durable
and easily
Operated.



ROYAL

(FIRE)

INSURANCE COMPANY

Of Liverpool, England.

ESTABLISHED 1864.

HEAD OFFICE METROPOLITAN DISTRICT,

No. 50 Wall St., New York.

TRUSTEES:

JACOB D. VERMILYE, HENRY PARKER,
OSGOOD WELSH.

E. F. REDDALL, Manager.

W. W. HENSHAW, Asst. Manager.

ROBERTS PATENT
'WOVEN WIRE CAR SEATS'
RATTAN, PLUSH SEATS
PATENT WOVEN WIRE SEAT, BACK SPRINGS
ADDRESS FOR CATALOGUE, ESTIMATES ETC
THE HARTFORD WOVEN WIRE MATTRESS CO.

O'NEIL'S Automatic Highway Crossing Alarm.

Suitable for All Locations, Either Double
or Single Track.

A LOUD BELL GIVING EFFECTIVE WARNING.

Ample tested under a service of 200 trains daily. Operated by a simple track
lever worked by elasticity of the rail as the wheels pass over it. Battery runs six
months. Minimum of care. Certainty of operation. Valuable also where gatemen
are employed.

For further information, and for names of roads using these signals, address

ELECTRIC SUPPLY & MFG. CO.,

113 Public Square, CLEVELAND, O.

JNO. W. CLARKE, Gen'l Western Agent, 470 The Hookery, Chicago, Ill.

IMPROVED ENGINE SPRINGS

EVERY SPRING GUARANTEED.

SEND FOR ILLUSTRATED CIRCULAR.

CHARLES SCOTT SPRING COMPANY

PHILADELPHIA.

945 Rookery, Chicago, Ill.

Southern Hotel, St. Louis.

Established 1847.

A. WHITNEY & SONS

Philadelphia, Pa.

CHILLED WHEELS for ENGINES and CARS,

Cast in the Whitney Contracting Chill and Warranted Smooth
and Round Without Grinding.

STEEL TIRED WHEELS WITH CAST IRON CENTRES.

"Spoke or Plate Pattern."

CHARLES S. HELLER

(ESTABLISHED 1870.)

TRADING AS



HELLER & BRIGHTLY,

MANUFACTURERS OF

ENGINEERING, MINING AND SURVEYING

INSTRUMENTS,

Cor. SPRING GARDEN STREET and RIDGE AVENUE,

PHILADELPHIA, PA.

HAYES TUBE EXPANDER.



TRIPLE EXPANSION ON

BY ROLLER PROCESS

Makes the Best Setting.

Recommended by U. S. Government.

HAYES TOOL CO.,

41 & 43 CROSS ST.,

PORTLAND, MAINE.

Charles Paine & Sons

Consulting and Civil Engineers,

71 Broadway, New York City.

Rail Roads

Preliminary Surveys,
Location,
Construction,
Equipment,
Water Supply,
Terminal Yards
Signals,
Electric Appliances.

Improvement of Villages and Estates.

ESTABLISHED 1864.

CHARLES F. KETCHAM & CO.

27 & 29 NASSAU ST. NEW YORK.

RAILROAD PRINTERS & STATIONERS

KEEP IN STOCK OF BEST APPROVED FORMS

BOOKS FOR STATION AND TRAIN USE.

SAGGAGE RECORD, CASH, FRY, CONDUCTORS CAR LIST.

FRT. FORWARD, FRT. RECEIVED, MARSHES COPIES.

TEL. TRAIN ORDER, &c., &c.

PAPER AND BOOKS FOR

ENGINEERS AND CONTRACTORS USE

BLUE PROCESS, FIELD, QUANTITY, TRADING,

GROSS SECTION, LEVEL, PROFILE, TRANSIT,

DETAILED EST., TIME, PAY ROLL, TOPOG.,

NO. RETURN, DRAWING, WAGES TABLE, &c., &c.

PRINT, RULE AND BIND IN ANY QUANTITY

BLANKS AND BOOKS FOR RAILROADS,

AND KEEP **STATIONERY** FOR ALL

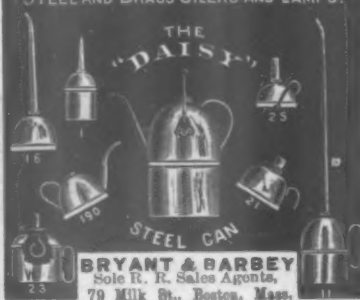
YOUR ORDERS OR CORRESPONDENCE SOLICITED.

H. A. WILLIAMS MFG. CO.

SOLE MANUFACTURERS OF THE

WILLIAMS' DRAPER, SYPHON

STEEL AND BRASS OILERS AND LAMPS.



Hoosac Tunnel Route,

FITCHBURG RAILROAD.

Short line between the East and West. Sleep-
ing and drawing-room cars on all express
trains

J. R. WATSON,

General Passenger Agent.

D. L. BARNES,

Mechanical and Consulting
Engineer.

**SPECIALTY: RAILWAY and LOCO-
MOTIVE WORK.**

Marine and land engine tests made at short
notice. Recent and scientific methods used in
all work.

The completion of inventions to practical ap-
plication, including specifications and esti-
mates, forwarded by new methods.

73 BROADWAY, NEW YORK,

AND

Rookery Building, Chicago, Ill.



Published Every Friday at
73 Broadway, N. Y.
\$4.20 PER YEAR TO UNITED STATES AND CANADA.
6.08 " " " FOREIGN COUNTRIES.

Express money orders, or drafts, or P.O. orders
or registered letters should be made to the order
of the Railroad Gazette.

EMPLOYMENT.

WANTED—FIRST CLASS LOCOMOTIVE ENGINEER, thoroughly competent to erect locomotives, to go to South America. One acquainted with American railroad appliances preferred.
Address S. L. L., P. O. Box 3327 N. Y. City.

A CIVIL ENGINEER WITH EXPERIENCE on location, construction and maintenance of railroads, and on mole and harbor works, desires a position. Good references. Speaks and writes Spanish. Address L. J., care Railroad Gazette, 73 Broadway, New York.

WANTED—A THOROUGHLY COMPETENT SUPERINTENDENT FOR CAR WORKS; must be energetic and fully competent to make contracts and estimates; give fully details of positions filled and references. Address "C. M. A.", care Railroad Gazette, 73 Broadway, New York.

WANTED AND FOR SALE.

We own and offer for sale 800 tons of selected second-hand 52-lb. steel rails for prompt shipment. Rails can be inspected at Pittsburgh. Price quoted on application to

ROBINSON & ORR,
Fidelity Building, Pittsburgh, Pa.

FOR SALE—ONE WORTHINGTON compound duplex pump; high pressure 25, low 33; strokes, 33 2-9 in. Plungers aluminum, bronze and steel fittings, and bronze cylinder, 1,500,000 galls. capacity. Boiler, 500 H. P., for 500 lbs. steam; Duplex (10 x 7 x 12); 850 H. P. Corliss engine, 2 Admiralty pumps, pressure pipe, 4 in., 3 in., 10 in., hoisters, boilers, crushers, tanks, compressors, hammer, locomotives, cars, steam shovels, contractors' tools and radiators. W. S. MIDDLETON, 22 John St., New York.

FOR SALE.

Second-Hand Standard Gauge Locomotives, with Westinghouse Air-Brakes, for immediate delivery. **NINE ENGINES FOR DELIVERY AT NEW YORK:** Cylinders, 10 in. x 14 in. and 10 in. x 16 in.; weight, 26,000 lbs., 33,000 lbs., 35,000 lbs. **TEN ENGINES FOR WESTERN DELIVERY:** Cylinders, 15 in. x 22 in., 15 in. x 24 in., 16 in. x 22 in., 16 in. x 24 in.; weight, 50,200 lbs. to 70,000 lbs. Builders: Baldwin, Rhode Island, Grant and Pittsburgh.

Steel Rails, Fastenings, and All Classes of New and Second-Hand Equipment.

Full description furnished on application.

GEO. A. EVANS, 40 & 42 Wall St., New York.

FOR SALE.

One standard gauge Baldwin locomotive, cylinders 12 in. x 20 in., double ender, weight 60,000 lbs., with Westinghouse brake, nearly new; two suburban passenger coaches.

One combination baggage and passenger coach, all with Westinghouse brakes, nearly new.

Above is now in Florida and can be delivered at once.
Baggage, mail and express car, length 45 ft. 2 in.

Two open excursion cars, seating 85, for New York delivery.

HUMPHREYS & SAYCE,
10 Wall Street, New York.

FOR SALE—AN OFFICIAL CAR, 48 ft. long, with six-wheel steel tired trucks, five Pullman sections, kitchen and observation room complete. Just out of shops. A bargain. For particulars address W. G. PEARCE, General Purchasing Agent, N. P. R. R., St. Paul, Minn.

WANTED—ONE COPY OF ILLUSTRATED CATALOGUE BALDWIN LOCOMOTIVE WORKS—last edition. J. B. LIPPINCOTT COMPANY, Philadelphia, Pa.

WHEEL PRESS WANTED—WISH to correspond with parties having a good second-hand machine for sale. State capacity and other particulars. **RAND DRILL CO.**, N. Tarrytown, N. Y.

ENGINEER'S AND FIREMAN'S

TIME, EXPENSE
AND
MEMORANDUM ACCOUNT BOOK.

DESIGNED AND COPYRIGHTED BY

E. W. YATES.

A pocket memorandum book with rubber tipped pencil attached, with calendar and pages most conveniently arranged for the engineer or fireman to keep his own daily record of time and miles run, rate and amount earned; also for individual expense account each month and for general memoranda. A certain method of checking with the timekeeper in case of disagreement. It lasts one year, and every engineer and fireman should have one. Price 50 cents each; \$30.00 for fifty copies, or \$35.00 a hundred. An agent wanted on each road.

PUBLISHED AND FOR SALE BY

THE RAILROAD GAZETTE, 73 Broadway, N. Y.

VENTILATORS



Made of galvanized iron and copper. Strong upward draft. Exhausts foul air, odors, gases, steam, etc. from mills, stores and dwellings; cures smoky chimneys. Perfectly storm-proof.
Galvanized iron and copper corners and gutters. Sheet metal work for buildings. Send for illustrated circular.

E. VAN NOORDEN & CO.,
383 Harrison Ave., BOSTON, Mass.

TEE AND STREET RAILS, REFLECTOR BARS, TRACK BOLTS AND NUTS, R. R. SPIKES.

PROGS, CROSSINGS, SWITCHES AND FIXTURES.

IRON AND STEEL AXLES, CAR TRUCK CHAINWHEELS, WROUGHT IRON TUBES, RUCKLES, LINKS AND PINS AND CAR COUPLERS.

BAR IRON AND STEEL, SHEET IRON AND STEEL, CORRUGATED IRON.

STEAM SHOVELS, BALLAST UNLOADERS, AND STEAM CRANES.

A. T. SHOEMAKER,
Railroad Supplies and Equipment.

(New and Second Hand.)

ROCKERT BUILDING, CHICAGO.

145 BROADWAY, NEW YORK.

BEAMS, CHANNELS, ANGLES, TEES AND ODD SECTIONS.

VAILE & YOUNG'S Patent Metallic Skylights



Without Putty. Construction adapted to all forms and styles of Skylights. Thousands of feet in use have proved its superiority. Particularly adapted for Depots, Mills, Factories, etc., where large and continuous lights are required. Send for Illustrated Catalogue.

HALF SIZE.
216 N. Calvert St., Baltimore, Md.

QUEEN & CO., PHILADELPHIA,

MANUFACTURERS OF

Engineers', Surveyors' and
Draughtsmen's Supplies.

Improved Complete Engineers' Transit.

Power of telescope, 24 diam. Compound long centers. Two outside verniers. Five-in. needle. Level to telescope, vertical arc, clamp and tangent and the usual accessories. Complete with box and tripod. **PRICE, \$180.**

ENGINEERS' PLAIN TRANSIT.

Same as above, without level, arc or clamp and tangent. **PRICE, \$150.**

Improved Engineers' Wye Level.

Telescope, 18 or 20 in. Power, 40 or 50 diameters, as desired. Shifting center. Complete with box and tripod and usual accessories. **PRICE, \$110.**

Any of these instruments sent on approval, with privilege to return if not satisfactory.

CATALOGUE ON APPLICATION.

M. A. WILDER, Pres.; T. S. BULLOCK, V.-P.; V. A. WILDER, Treas.; F. C. B. AVERY, G. M.

THE NEW YORK RAILWAY SUPPLY CO., Limited,

40 AND 42 WALL STREET, NEW YORK.

Steel Rails, all sections; Track Fastenings, Locomotives and Cars of all descriptions, both New and Second-hand, for Cash or on Car Trust Plan.

Purchasing Agents Monterey & Mexican Gulf R. R.

Railway contracts and securities negotiated.

Correspondence solicited.



JANUARY 1, 1892.

SEND FOR SPECIAL LIST OF

New and Second Hand Machinery

FOR SALE AT LOW PRICES BY

GEORGE PLACE,

Office, 170 Broadway, New York. Storehouse, 511 & 513 W. 13th St., New York.

INTERNATIONAL RAILWAY EQUIPMENT AND SUPPLY CO.

INCORPORATED.

PRINCIPAL OFFICE "ALDRICH COURT," 45 BROADWAY, N. Y.

ORDERS AND INQUIRIES SOLICITED FOR EVERY DESCRIPTION OF

RAILWAY EQUIPMENT AND SUPPLIES.

G. W. BENTLEY, Pres.

G. LEVE, V. P. & G. M.

AMERICAN SUPPLY CO.

First Floor, Boston Building,
KANSAS CITY, MO.

RAILWAY EQUIPMENT AND SUPPLIES.

New and Second-Hand Rails.

Track Material. Locomotives and cars.
Car Trusts Negotiated.

LINK BELT MACHINERY CO.

CHICAGO, ILL.,

MANUFACTURERS OF IMPROVED

FREIGHT AND COAL

HANDLING MACHINERY.



FOR SALE BY
Norton Door Check & Spring Co.,
500 Sears Bldg., Boston, Mass.
AGENTS WANTED.



ESTABLISHED 1820.

PATENT TRANSITS

YOUNG & SONS,

Engineering Instrument Makers,
43 NORTH SEVENTH STREET,
Philadelphia.

Tapes, Chains, Draughting Instruments. Catalogues on application.

FLOOD-CONKLIN CO.

VARNISH MAKERS,

NEWARK, N. J.



Railway Varnishes and
Surfacers

A SPECIALTY.

CHARLES H. BRIGHTLY.

Late of HELLER & BRIGHTLY,

MANUFACTURER OF

Mathematical, Engineering and Surveying

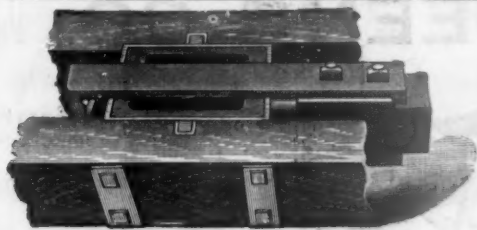
INSTRUMENTS.

Germantown Junction, P. R. R.

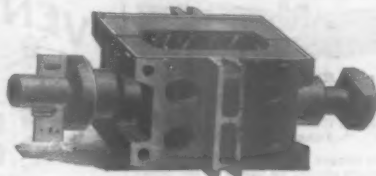
18th St. Station, P. & R. R. R.

PHILADELPHIA, PA.





BUTLER
Drawbar Attachment
COMPANY,
CLEVELAND, O.



Dear Sir:

This company is aware that some Butler Drawbar Attachments in the past have broken; the greater portion was grey iron, some malleable. We have refused to allow any more Butler Drawbar Attachments to be made in grey iron, and have strengthened the patterns for malleable iron so that in the future there should be but few breakages.

Our guarantee covers such Butler Drawbar Attachments as were furnished by us or through our authorized manufacturers, bearing trade-marks as follows:



Any castings not showing these marks the CAR BUILDERS should be held responsible for.

The improved or yoke style of Butler Drawbar Attachments overcomes all the objections used against the tail bolt or stem pattern. It has been proven beyond doubt that 90 per cent. of the breakages have been caused by small headed tail bolts and thin, improperly cottered tail bolt keys. If a key, cottered properly, as shown on page 6 of our catalogue, was used few breakages would occur. We can give unquestionable references to prove this.

Hoping to be favored with your orders, we are,

Yours truly,

Butler Drawbar Attachment Co.

GEO. A. BOYDEN, President.

WM. WHITRIDGE, Treasurer.

CHAS. B. MANN, Secretary.

THE BOYDEN BRAKE COMPANY,

BALTIMORE, MD., U. S. A.

MANUFACTURERS OF

AUTOMATIC QUICK-ACTION AIR BRAKES

FOR PASSENGER CARS, FREIGHT CARS AND TENDERS.

ALSO DRIVER BRAKES AND AIR EQUIPMENT FOR ENGINES.

The Entire Brake and Signal Apparatus Is Interchangeable with the Westinghouse

OUR APPARATUS IS IN SUCCESSFUL OPERATION ON 45 ROADS.

THOS STURGIS, President.

WM. C. LANE, Secretary and Treasurer.

C. P. MACKIE, General Manager.

S. B. BOGART, General Agent.

ELECTRIC SECRET SERVICE COMPANY

45 BROADWAY, NEW YORK.

Owning the Patents of Mosher, Gill, Hatch, Foote, Kintner and Moore for

**Individual Telegraph Call and Cut-Out Apparatus
FOR RAILWAY SERVICE.**

OTHER PATENTS PENDING. The Only Practical and Reliable System Invented. Use either MORSE KEY or AUTOMATIC TRANSMITTER. To every call an AUTOMATIC ANSWER-BACK is received from the Station Called. Gong rings until shut off by operator. Any office on line can be selected without disturbing the others and either called up or cut out. No interference with regular telegraph service. No resistance added to main line. Easily applied. Economical. Convenient. Reliable. THE PUBLIC IS WARNED AGAINST INFRINGING COMPANIES AND DEVICES. For terms and other particulars address as above

M. C. B. COUPLERS.—COMPARISONS.

Official Records, 10,676

Standard Couplers.

Date.	Drawheads.	Knuckles.
September, 1890, -	5	49
October, " -	8	81
November, " -	48	147
December, " -	30	131
January, 1891, -	22	116
February, " -	66	122
March, " -	63	172
April, " -	31	176
May, " -	13	100
June, " -	28	110
July, " -	13	72
August, " -	19	104
September, " -	21	78
October, " -	18	112
Total, -	422	1,363

PERCENTAGE OF BREAKAGES FOR ONE YEAR.

Drawheads, -	3 ³⁹ / ₁₀₀
Knuckles, -	12 ⁵⁴ / ₁₀₀

LIFE.

Drawheads, -	30 years.
Knuckles, -	8 "

The Standard Car Coupling Co.

Will contract with any railroad company to equip 1,000 or more cars at low prices, and will agree to maintain them for

\$650 PER THOUSAND CARS.

Compare the Following:

10,000 Couplers.

Date.	Drawheads.	Knuckles
September, 1890 -	174	138
October, " -	147	311
November, " -	274	492
December, " -	283	308
January, 1891 -	252	382
February, " -	271	484
March, " -	249	638
April, " -	223	322
May, " -	216	360
June, " -	227	311
July, " -	231	434
August, " -	232	433
Total, -	2,781	3,433

PERCENTAGE OF BREAKAGES FOR ONE YEAR.

Drawheads, -	27 ⁸¹ / ₁₀₀
Knuckles, -	54 ⁵⁵ / ₁₀₀

LIFE.

Drawheads, -	3 yrs. 6 mos.
Knuckles, -	1 " 9 "

Should seventy-five per cent. of above breakages be replaced without charge, and twenty-five per cent. at, say **\$9.20** each for drawheads, and **\$2.80** for knuckles, the cost of maintenance would be about **\$2.04** per car per annum, and would cost, exclusive of locks, etc.

\$2,040 PER THOUSAND CARS.

The Standard Co. is also prepared to contract with Railways and Railway Systems, for a part of their equipment, at low prices, and guarantee to replace ALL breakages (including locks) of the Standard Coupler (WITHOUT CHARGE) FOR ONE YEAR OR LONGER, and to furnish security for the fulfillment of contracts.

THE STANDARD CAR COUPLING CO.,

Main Office: 45 Broadway, NEW YORK. CHICAGO OFFICE: 1918 The Rookery.

A SIGNAL SUCCESS.

OUR SYSTEMS of automatic electric block signals (on wire and rail circuits) are working with great satisfaction to the railroad companies using them, and in almost every case their use is being extended.

Our new rail-circuit systems are showing unparalleled results. Eleven of these signals on a certain road have been operating over five months with a record of but three train stops (caused otherwise than by trains in block and open switches), and these were due to signals being struck by lightning, and to one broken battery jar. They have also operated with **ABSOLUTE RELIABILITY**. On another road the record is even better; no unnecessary stops whatever being charged against the signals; and the integrity of the system has been fully proven.

We can, therefore, safely challenge comparisons with other rail-circuit systems, being confident that no better records can be shown, or as good.

Having substantiated our claims to the complete satisfaction of many leading railroad officials, we are now engaged in applying the systems on several new lines, and we are also engaged in preparing **PLANS AND ESTIMATES FOR THE APPLICATION OF THE SIGNALS FOR MANY OTHER COMPANIES**, several of whom do not consider any other signal than

— THE HALL. —

We pride ourselves on the excellent and honest character of our work, and beg to assure all who deal with us that they will be fairly and squarely treated, and always with the assurance of satisfaction. All correspondence that may be addressed to our New York or Chicago office will receive careful and immediate attention, and any inquiries on any subject relating to our specialties will command the professional knowledge and skill of our engineering department.

THE HALL SIGNAL COMPANY.

50 Broadway, New York.

340 The Rookery, Chicago.

WILLIAM P. HALL, President.
S. MARSH YOUNG, General Agent.
C. W. BREWSTER, Sales Agent.

HENRY BEZER, Mechanical Signal Engineer.

W. S. GILMORE, Treasurer.
MELVILLE P. HALL, Secretary.
A. J. WILSON, Sup't Electrical Construction.

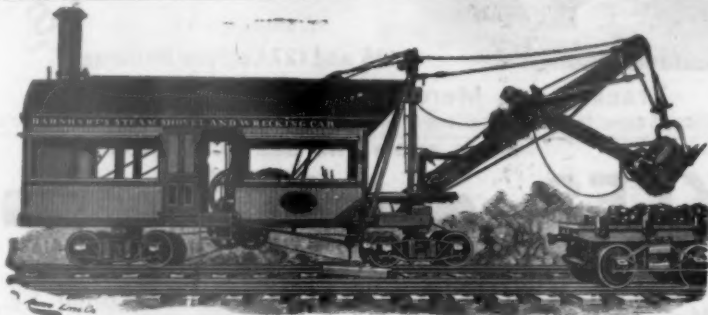
INDUSTRIAL WORKS,
BAY CITY, MICH.

NEW YORK AGENCY
OFFUTT & CO.,
Corner Church and Hector Street

CHICAGO AGENCY
L. M. SLACK,
411 Phenix Building.

CRANES,
WRECKING CARS,
STEAM SHOVELS,
PILE DRIVERS,

RAIL SAWS,
TURN-TABLES,
TRANSFER TABLES,
FREIGHT CONVEYORS.



One and One-half Yard Shovel.

MARION STEAM SHOVEL COMPANY

MANUFACTURERS OF

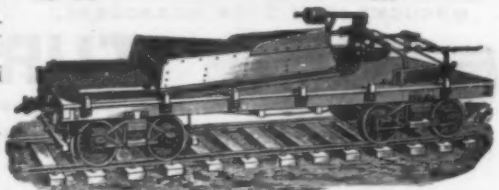
BARNHARDT'S PATENT STEAM SHOVELS, WRECKING CARS AND DREDGES
RAILROAD DITCHERS AND BALLAST UNLOADERS.

All of our machines guaranteed to give entire satisfaction, otherwise may be returned at our expense.
For further information, photographs, catalogues and discounts address

Marion Steam Shovel Co.,

595 West Centre Street,
MARION, O.

San Francisco Office:
Geo. W. Barnhardt, 4 Sutter St.



Barnhardt's Patent Ballast Unloader.

JOHN SOUTHER & CO., BOSTON, MASS.
EXCLUSIVE MANUFACTURERS OF THE OTIS



Patent Steam Excavators,
WITH CHAPMAN'S IMPROVEMENTS AND DREDGES.

DREDGES & SHOVELS

STEAM DREDGES.
STEAM SHOVELS.

—FOR ALL PURPOSES.—

Bucyrus Steam Shovel & Dredge Co.,
BUCYRUS, OHIO.

OSGOOD DREDGE CO., 37 State Street, Albany, N. Y.



STEAM EXCAVATOR AND DERRICK CAR
Aside from Our Standards (Nos. 1 and 2) we Build Machines of Special Design, or from any Drawings Furnished.



THE CYCLONE PORTABLE FORGES

Have Double Ratchet, Solid Frame, Adjustable Legs, Detachable Lever. Run Lightest, Make Strongest Blast & Last Longest. ALL DESIRABLE STYLES AND SIZES.

Sold by Hardware and Machinery Dealers everywhere. Send for Catalogue of these and

Hand & Power Blower, Blacksmith Drill Presses, &c.
THE FOOS MFC. CO. SPRINGFIELD, OHIO.

Rock Drilling and Air Compressing

MACHINERY

FOR

TUNNELS, QUARRIES, MINES, RAILROADS,

And Wherever Ore and Rock are to be drilled and blasted.

RAND DRILL CO.,

23 Park Place, NEW YORK.

SPECIAL NOTICE.

Two handsome photo-engraved display sheets entitled:

"Recent Improvements in Air Compressors."
"Recent Improvements in Rock Drills."

Mailed free to any one who will cut out this advertisement and mail it to us with his name and address.

THE INGERSOLL-SERGEANT DRILL CO.,
No. 10 PARK PLACE, NEW YORK.

THE NEW HIGH EXPLOSIVE

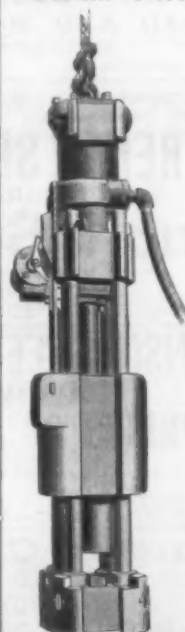
RACKAROCK

Furnished in two ingredients which are absolutely unexplosive until combined by the consumers, for which we furnish convenient means. Shipped and stored as ordinary merchandise. After combination the explosive is absolutely safe. By reason of its safety it is especially adapted to water-works construction in crowded streets.

Rendrock Powder Co.

23 PARK PLACE, NEW YORK

Steam Pile Hammers.



WINONA, MINN.,
Sept. 3, 1880.
VULCAN IRON WORKS:
GENTLEMEN: Our Steam Hammer recently purchased from you is giving very good satisfaction, and has given us no trouble whatever so far. The hose also is wearing well.

Yours respectfully,
UNION BRIDGE CO.,
By THOS. J. LONG.

QUANAH, TEX.,
Nov. 2, 1880.

VULCAN IRON WORKS:
GENTLEMEN: The No. 2 Vulcan Steam Hammer I purchased of you some three months ago has given perfect satisfaction. I have just finished driving some 50 piles in quicksand with the best of success, driving a great many of these as deep as 28 ft. in the sand. I have also used the Steam Hammer purchased of you by the Pan Handle Construction Co., while in the employ of the Fort Worth & Denver Railroad, for over three years, and have used it in all kinds of soil, getting from 10 to 14 ft. more of a drive than could be had with the old style of drop hammer. Yours truly,
F. J. WILCOX,
Ex. Supt. Ft. & D. R. R.,
Fort Worth & Denver R. R.

Above testimonials refer to our No. 2 size hammer.
VULCAN IRON WORKS,
CHICAGO.

New Revised Edition of
CAR-BUILDERS' DICTIONARY
Price, \$3 per copy.

ILLINOIS STEEL COMPANY

Manufacturers of Bessemer Foundry and Mill Pig Iron, Spiegel and Ferro-Manganese; Iron Rods of any required chemical composition; Iron or Steel Car Truck Channels; Steel "I" Beams and Structural Shapes. and Steel Merchant Bar; Nails and Rail Fastenings; Light "T" and Street Rails; Steel Blooms, Slabs, Billets and Wire Shapes always in stock. Special Sections and Shapes made to order.

BESSEMER STEEL RAILS

FROM 8 TO 100 LBS. PER YARD.

This Company owns and operates five works, namely: NORTH WORKS and UNION WORKS, Chicago; SOUTH WORKS, South Chicago; JOLIET WORKS; MILWAUKEE WORKS. JULIAN L. YALE, General Sales Agent, General Offices, "Rookery," Chicago, Ill. Milwaukee (Wis.) Office, 151 N. W. Ins. Building. New York Offices, 46 Wall Street. D. E. GARRISON & CO., Agents, St. Louis, Mo.

THE SPRINGFIELD IRON COMPANY,

SPRINGFIELD,
CHICAGO OFFICE:
710-711 Phenix Building.



ILLINOIS
ST. LOUIS OFFICE:
125 and 127 Laclede Building.

IRON AND STEEL SPLICE BARS.

Track Bolts, Merchant Iron and Bar Steel. The largest capacity and best facilities in the United States for making Angle Splice Bars.

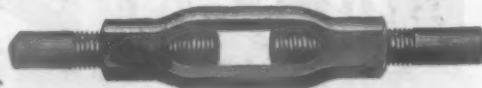
WROUGHT-IRON OPEN HEXAGONAL.

MADE FROM THE BEST CHARCOAL IRON.



TURNBUCKLES.

Guaranteed Stronger than any Similar Article on the Market.



Eastern Agents:
ANTHONY & McELROY, 328 Chestnut St., Philadelphia.
Western Agents:
H. L. GREEN & CO., 46 Lake St., Chicago.

The Only Buckle Made that has
a Perfect Wrench Hold.

The Central Iron & Steel Co.,
BRAZIL, IND.

CAMBRIA STEEL RAILS.

HEAVY RAILS, LIGHT RAILS AND RAIL FASTENINGS.
STEEL CAR AXLES. STEEL CAR CHANNELS.
STREET RAILS.

ADDRESS: CAMBRIA IRON CO.,
Office, 218 South Fourth St., Philadelphia, Pa.
Chicago Office:
Phenix Building.

CHARLES HUSTON, Pres. A. F. HUSTON, Vice-Prest. C. L. HUSTON, Gen. Man.
R. B. HAINES, Jr., Sec'y. JOS. HUMPTON, Treas.

LUKENS IRON & STEEL CO.

ESTABLISHED 1810. INCORPORATED 1890.

The First to Make Boiler Plates in America.

STEEL AND IRON PLATES.
Firebox Steel Plates a Specialty. We Can Roll Steel Circles 116 in. Diameter or Rectangular Plates 114 in. Wide. Range of Thickness, from 1/4 to 1 1/2 in.

This represents a piece of Lukens' Boiler Steel 1-8 in. thick, ready to be tested.

2 IN.

HALF SIZE.

This represents the same piece after having been pulled to the breaking point, showing a reduction of area of 65 per cent., and an elongation of 2 in. of 41 per cent.

2 IN. + 42 %

We gauge heads and fine holes. We drill and ream to order. We roll extremely wide plates. We roll bottoms for car tanks in one piece.

AGENTS:—Gilchrist & Taylor, 108 High St., Boston; Frank L. Fournet, 112 John St., New York; J. F. Corlett, Perry-Payne Building, Cleveland, O.; The Scully, Castle Co., 64 S. Canal St., Chicago; Stauffer, Eshleman & Co., 71 Canal St., New Orleans; R. A. Kinney & Co., Cincinnati, O.; R. C. Hoffman & Co., South and 2d Sts., Baltimore; Thomas Robertson & Co., Montreal, Canada. Works: Coatesville, Pa. Philadelphia Office: Rooms 62 & 64, Bullitt Bldg.



METCALF, PAUL & CO

Make a Specialty of

SOLID STEEL

RAILROAD TRACK TOOLS.

ALSO SOLE MANUFACTURERS OF

THE PATENT

VERONA NUT LOCK

SEND FOR OUR NEW CATALOGUE.

Western Warehouse:

7th Av. & LIBERTY ST., PITTSBURGH. 64 & 66 S. CLINTON ST., CHICAGO

THE FARIST STEEL COMPANY

JOHN FARIST, Pres.
GEO. WINDSOR, Sec. and Treas.

Manufacturers of all descriptions of
CAST STEEL
HAMMERED OR ROLLED



SPiral AND ELLIPTIC CAR SPRINGS
RAILROAD AND MACHINERY FORGING.

CHICAGO: Bridgeport, Conn. St. Louis:
J. S. BREWER, 176 Jackson Street. J. H. WYETH, 221 Chestnut St.

AARON FRENCH, Chairman. GEO. W. MORRIS, D. C. NOBLE,
JULIUS E. FRENCH, Vice Chairman. Gen. Man'r. Sec. and Treas.

THE A. FRENCH SPRING CO. LIMITED

PITTSBURGH, PENNA.

ELLIPTIC & SPIRAL SPRINGS

OF EVERY DESCRIPTION.

NEW YORK: 88 Boreel Bldg. BOSTON: 52 Mason Bldg. CHICAGO: Phenix Bldg.

THE ATKINSON STEEL AND SPRING WORKS

MANUFACTURERS OF

CAR SPRINGS OF EVERY DESCRIPTION.

Cast Steel, Spring Steel, all sizes and grades. Railroad Spring Steel a specialty.

OFFICE: "Rookery" Building, Chicago, Ill.

WORKS: Spalding, Ill.

Passenger Car Ventilator.

ALL CINDERS, DUST AND DIRT EXCLUDED.

A SUPPLY OF FRESH AIR GIVEN.

PERRY VENTILATOR CO.,

L. F. BRAINE, Gen'l Sales Agent,
Room 30, 115 Broadway, Boreel Building, New York.

THOMSON'S SLOTTED RIVETS.

Sectional view.



Sectional view when set.

The only rivet in the world that can be set without a machine.

For fastening Belts, Straps and other articles made of Leather, Rubber, Canvas, Felt, Pasteboard, Sheet Iron or Wood.

SIZES 1/4, 1/2, 3/4, 1, 1 1/2, 2, No. 9 Wire Gauge.

SIZES 1/4, 1/2, 3/4, 1, 1 1/2, 2, No. 6 Wire Gauge.

JUDSON L. THOMSON MFG. CO.,
WALTHAM, MASS.



WILLARD L. CANDIE and H. DURANT CHEEVER, Business Managers.

THE INTERNATIONAL

OKONITE COMPANY

LIMITED.

18 Park Row, New York.

INSULATED WIRES AND CABLES

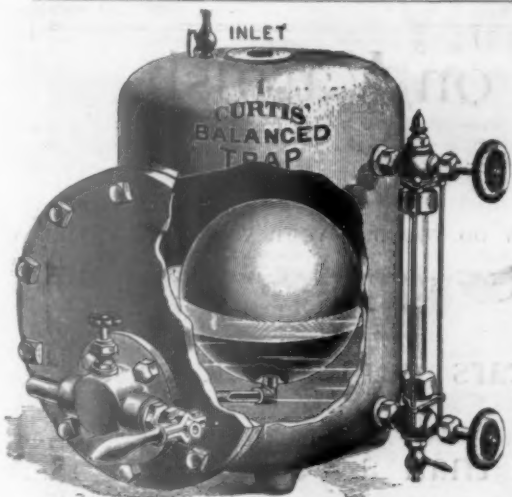
FOR AERIAL, SUBMARINE AND UNDER GROUND USE.

SOLE MANUFACTURERS OF

CANDIE AERIAL WIRES.
MANSON PROTECTING-TAPE.
OKONITE WATER-PROOF TAPE.



BRANCHES: Chicago, Philadelphia, Boston, San Francisco, Cincinnati, Louisville, Omaha, Minneapolis, St. Louis, Kansas City, London, South America.



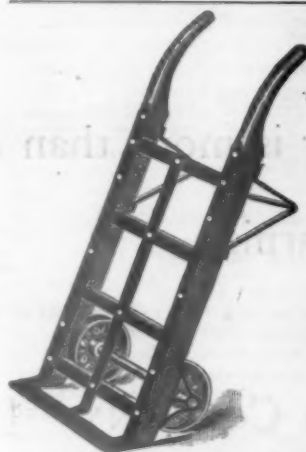
CURTIS BALANCED VALVE TRAP.

Cheapest, Most Durable, Most Powerful. Have stood the test of Seven years. WITHOUT EQUALS.

OUR PATENTS:—Damper Regulators, Steam Pressure Regulators, Pressure Regulators for Steam, Water and Air; Steam Traps, Return Traps, Separators, Balanced Steam Traps, Thermostatic Damper Regulators for Residences and Public Buildings, and other Specialties for the Use and Saving of Steam.

FULL INFORMATION CHEERFULLY FURNISHED BY THE
CURTIS REGULATOR CO.
63 BEVERLY STREET, BOSTON, MASS.

GENERAL AGENCIES:
NEW YORK, 100 Liberty St. PHILADELPHIA, 2035 N. Front St.
CHICAGO, 218 Lake St. DENVER, Col., Amphie Building.



More Wear and Tear IN OUR BAGGAGE and FREIGHT TRUCKS

Than Any Others Made.

Illustrated Catalogues, Price Lists, etc., Cheerfully
Furnished by

BOSTON & LOCKPORT BLOCK CO

162 Commercial Street, Boston, Mass.

THESE GOODS ARE ALSO FOR SALE BY
C. H. Beasley & Co., 175 Lake St., Chicago, Ill.
C. H. Gurney & Co., 247 Lake St., Chicago, Ill.
Broderick & Bascom Hope Co., St. Louis, Mo.
H. B. Newall & Co., 105 Chambers St., New York, N. Y.
Frank Baldwin, 33 South St., New York, N. Y.

ALL GOODS MADE ON HONOR.

LOUD'S PATENT HAND-POWER PUMP

Most Powerful Made.

Pumps Water Containing Every-
thing but Rocks.

Capacity, 3,000 to 5,000 gallons
an hour.

Always use

Star Brand Tackle Blocks SAFE, SURE, BEST.

Important to Railroad Managers
and Master Mechanics.

SIBLEY'S PERFECTION VALVE OIL.

More perfect lubrication insured, and entire
freedom guaranteed from corrosion of cylinders
and destruction of steam joints by fatty acids.
In exclusive use on 50 railroads.

References and prices furnished upon appli-
cation.

Make exclusive specialty of the
Manufacture of Valve and Signal Oil
for Railroad use.

SIGNAL OIL WORKS

(Limited),

FRANKLIN, PA.

J. C. SIBLEY,
PRESIDENT.

STOW FLEXIBLE SHAFT,

For Tapping and
Reaming Stay
Bolt Holes in
Boilers.

Portable Drilling



STOW MFG. CO., Binghamton, N. Y.
Inventors and Manufacturers of the Stow
Flexible Shaft for all purposes.

Stow Flexible Shaft Co., Limited,

26th, Calverhill and
Middle Sts., Phila., Pa.

Manufacturers of

FLEXIBLE SHAFTS,
And all kinds of Machines
to be used with them.
Portable Drilling, Tapping,
Reaming and Boring Ma-
chines. Also Portable
tools for em-
ery wheel
grinding,
metal and
wood pol-
ishing, cat-
tle brushing
and clip-
ping, etc.



Builders of Special Machines for railroads,
Bridge and Boiler Makers, Contrac-
tors, etc.

SPECIAL HOSE FOR STEAM HEATING CARS AND WESTINGHOUSE AIR BRAKE HOSE.

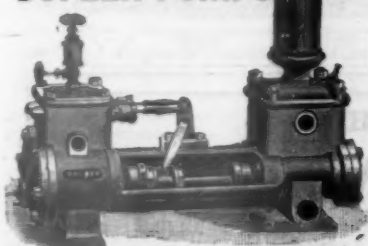
Fully Guaranteed. Write for Prices and Samples.

NEW YORK BELTING & PACKING CO., Limited,

JOHN H. CHEEVER, J. D. CHEEVER, } Managers.
P. CAZENOVE JONES,
WM. T. BAIRD, Secretary.

15 PARK ROW, NEW YORK

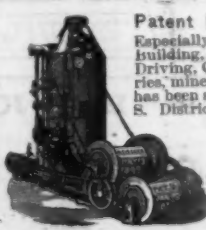
DUPLEX PUMPS



VALLEY PUMP CO., EASTHAMPTON
MASS.

HOISTING ENGINES of any power

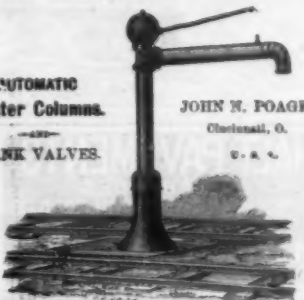
DOUBLE AND SINGLE, WITH IMPROVED



Patent Friction Drums
Especially adapted for Bridge
Building, Dock Building, Pile
Driving, Coal Hoisting, quar-
ries, mines, etc. This patent
has been sustained in the U.
S. District Court, Southern
Dist. of N. Y., by
Judge Wheeler.
Also by Judge Nixon,
in U. S. Circuit
Court, Dist. of N. J.
J. S. MUNDY.
22 & 24 Prospect St.

NEWARK, N. J.

AUTOMATIC
Water Columns.
TANK VALVES.



JOHN N. FOAGER,
Cincinnati, O.
U. S. A.

Corliss Engines

of the highest type and in
all sizes are made by

THE LANE & BODLEY CO.,
CINCINNATI, O.

UNION IRON WORKS,

SAN FRANCISCO, CAL.

Only Iron and Steel Ship Builders on
Pacific Coast.

MINING MACHINERY

A SPECIALTY.

HYDRAULIC LIFT DOCK

THE LAIDLAW & DUNN CO.



NEW DEPARTURE IN RATCHET DRILLS

SCHUTTLER MFG. CO.

FRANK BAKEMAN & CO., 6 Rotunda, Rookery, Chicago, GENERAL AGENTS.
AVERY & WEST, 450 Rookery, Chicago, WESTERN AGENTS

The movement of the
handle in either direc-
tion causes a contin-
uous drilling, thus doing
the work in half the
time of any other ratchet
drill without addition-
al labor. The drill is
strong, durable and
easily operated, the
working parts being
completely protected
from dust and weather.



R. D. WOOD & Co. Engineers, Iron Founders, Machinists,

PHILADELPHIA, PA.

CAST IRON PIPES. HYDRAULIC TRAVELING CRANES.

Hydraulic Cranes, Presses, etc. Hydraulic Car and Freight Lifts

HEAVY LOAM AND MACHINERY CASTINGS.

BROWN & SHARPE MFG. CO., PROVIDENCE, R. I.

CAST IRON STRAIGHT EDGES.



18" x 1 1/2"	7 lbs.	\$7.00
24" x 1 1/2"	10 "	9.50
30" x 1 1/2"	16 "	12.00
36" x 1 1/2"	19 "	15.00
48" x 2"	36 "	20.50
60" x 2 1/4"	51 "	26.50
72" x 2 1/4"	78 "	33.00
84" x 2 1/4"	103 "	39.00
120" x 2 1/4"	175 "	45.00



ON YOUR STEAM - HEATING SYSTEM.

A recent order from the Consolidated Car-Heating Company, whom we have supplied since their incorporation, shows that our Valve is still appreciated by those who must have tried it most thoroughly.

MASON REGULATOR COMPANY, BOSTON.

PURE ALUMINUM.

The Pittsburgh Reduction Co., 95 Fifth avenue, Pittsburgh, Pa., offer Aluminum guaranteed to be equal in purity to the best in the market at the lowest rates obtainable. Prices given on application. Aluminum sheet, wire and castings at best rates. Aluminum polish, very efficacious and non-poisonous, suitable for household use as well as for manufacturing purposes.

ALUMINUM SOLDER.

CORRESPONDENCE SOLICITED.

Facts on Varnish.

NO. 90.—HOW DO YOU BUY YOUR VARNISH?

If your cars come back to the shop in less than a year, there is something wrong.

The use of the car is more than the cost of durable varnish.

MURPHY VARNISH COMPANY.

FRANKLIN MURPHY, President.

Head Office: Newark, N. J.

Other Offices: Boston, Cleveland, St. Louis and Chicago.

Factories: Newark and Chicago.



ARTIFICIAL STONE AND ASPHALT PAVEMENTS

ESPECIALLY ADAPTED FOR RAILWAY STATION PLATFORMS, ROUND HOUSES, FLOORS IN SHOPS, ETC.

WEHN PAVEMENT CO.,

16 & 18 EXCHANGE PLACE NEW YORK

TRAUTWINE'S POCKET BOOK.

"Without doubt it has proved itself to be the most useful handbook in the language for the engineering profession."—*Engineering and Mining Journal*, Aug. 25, 1888.

JOHN WILEY & SONS, New York.

E. & F. N. SPON, London.

SPRAGUE, DUNCAN & HUTCHINSON, Limited.

FRANK J. SPRAGUE,
LOUIS DUNCAN, Ph. D.,
ALFRED BISHOP MASON,
CARY T. HUTCHINSON, Ph. D.

CONSULTING ELECTRICAL ENGINEERS.

15 WALL STREET, NEW YORK.

H. W. JOHNS'

Asbestos Materials.

Asbestos Millboard—Flat Packing, composed wholly of pure Asbestos, and weighs per cent. less than adulterated Millboard.

Asbestos Piston Rod Packing.—The most durable and easily applied. Indestructible by acids, or any degree of heat.

Asbestos Cloth, Cord, Twine and Sewing Twine. Asbestos Building Felt and Sheathings.

Vulcanite, for electrical plates, rings, washers, sheet packing, accumulator cells, etc.

H. W. JOHNS MANUFACTURING COMPANY,

Sole Manufacturers of H. W. Johns Asbestos Steam Packings, Boiler Coverings, Liquid Paints, Roof Paints, Roof Cement, Fire-Proof Paints, etc.

87 MAIDEN LANE, NEW YORK. CHICAGO. PHILADELPHIA. BOSTON. LONDON

NORVIN GREEN, President.
JOHN E. GREEN, Vice-President.

LOUISVILLE CAR WHEEL
AND RAILWAY SUPPLY CO.,
MANUFACTURERS OF

Chilled Car Wheels

Of Best Cold-Blast Charcoal Iron.
Street Railroad Wheels.

Wheels Fitted on Axles,

OFFICE AND WORKS:

1021 E. Jefferson St., Louisville Ky.

SOLID BRAIDED BELL CORD.

Air Brake Cord. Engine Bell Cord.

Sash Cord. Arc Lamp Cord.

SAMSON CORDAGE WORKS, 115 Congress Street, Boston

EDWARD SMITH & CO., RAILWAY VARNISHES, Times Building NEW YORK.



FRIDAY, FEB. 5.

CONTENTS.

ILLUSTRATIONS:	PAGE.	NEW PUBLICATIONS:	PAGE.
Maine Junction, West		General News:	
Philadelphia, Pennsylvania		Locomotive Building	107
Railroad, Crossing of Two		Car Building	107
Track Railroad with Four		Bridge Building	107
Track Road, without		Meetings and Announcements	108
Crossing Frogs	93	Personal	108
Locomotive Hotel—Chicago	94	Elections and Appointments	109
& Northwestern Railway		Railroad Construction	110
Mandrel Rolled Hollow Stay-		General Railroad News	111
bolts	97	Traffic	112
Details of Freight Car Con-		MISCELLANEOUS:	
struction	98-100	Technical	105
Lamont's Steel Car	99	The Scrap Heap	106
Standard Turn-Table—Pas-		Railroad Law	107
sade Rolling Mill Co.	101	The Elevated Railroad Cases	98
Shiner Road Grinder	105	In New York	
CONTRIBUTIONS:		Coaling Stations for Loco-	94
Testing Air Brakes	93	motives	
Second Orders for Com-		A French Railroad Com-	96
pound Locomotives	98	mission	
EDITORIALS:		The Government Accident	97
Three Thousand Miles of		Statistics	
Block Signals	102	New Office of the Western	
New York to Chicago in 18		Union Telegraph Co. in	
Hours	103	New York City	101
Railroad Growth and Pa-		Foreign Railroad Notes	104
liamentary Costs in England	108	Lamont and Bronner's Car	
Passenger Statistics—Prus-		Roof	104
sian State Railroads	108		
EDITORIAL NOTES	102-108		

Contributions.

Testing Air Brakes.

NEW YORK, Jan. 29, 1892.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I had not heard that the Southern Pacific had issued an order for testing brakes on air-braked trains in motion. I have never heard of such an order being given by any other railroad company.

There may be some reasons for doing this which do not occur to me; but, on the whole, I should consider it an undesirable thing. It always seems undesirable to have alternate or corroborative tests in a case like that of testing the condition of the air brakes upon the train, where the condition of the brakes can not be determined by one person, but needs the combined action of several persons. Where more than one method of testing is mentioned, or even permitted, cases may arise where one will be used and other cases where another will be used. Unless all methods are equally efficacious, therefore, the danger that an improper one will be used, instead of the established one, is considerable.

It is quite evident that when the cars are in motion it is impossible to ascertain whether all the brakes are applied or what the piston travel may be. In the release it is quite likely that some brake would not be released, which would escape observation, and thus the train would be drawn with the brakes dragging. On the other hand, it is perfectly well known that if the brakes are found to apply and release properly when the train is standing, the proper action of the brake in motion is assured.

The instructions contained in the recommendations of the M. C. B.'s committee are such that, if carried out, safety is assured. It seems to me that any further tests by the engineer, such as letting the air all out of the train pipe, as recommended by the Western Railway Club, or any other method, by which the engineer may, in some way, assure himself that the brakes are approximately correct, should be not only not recommended, but prohibited, lest he be led to imagine that he can determine with sufficient accuracy by such means the condition of the brakes, and the regular test be thus dispensed with on occasions where time is short.

R. A. PARKE.

Second Orders for Compound Locomotives.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Some of the technical papers have found what they believe to be a lack of confidence on the part of those railroads that have used compound locomotives in the fact that some have not renewed their orders for this type of engine. The truth is that in the few cases where this has occurred there are no other reasons than those of the success or want of success of the engines.

The one principal reason is that the builders of the locomotives have expressed their intention to experiment further before deciding on a standard design, and any railroad company is justified in postponing orders for compounds until the experimental stage is more nearly past; that is, if any builder is undecided in his belief that the design of compound which he is offering is the final or nearly the final design, then a railroad company is justified in postponing orders for the present.

So far there have been used in this country eight distinct styles of compound locomotives. Naturally enough some of these have not been as successful as expected, and they have been changed from time to time as im-

*A rule has been adopted on the Southern Pacific in Texas requiring engineers, both passenger and freight, to make a trial application of the air brakes after starting the train and before attaining a speed of more than six miles an hour. This is to be done at the beginning of the trip and whenever a car has been taken or left.—*Railroad Gazette*, Jan. 29.

provements have suggested themselves. Others have been so rapidly developed that the experimental stage is past, so that the refusal of any railroad company to order compounds in large numbers when they have previously had experience with a single engine, indicates not the compound in general is not a success, but only that the type which they have tried is either found to be not as satisfactory as expected, or its builders have shown an inclination to change to other styles.

After canvassing the success of the eight different types of compounds, I find that in every instance there has been shown a decided saving in fuel, and the entire difficulties so far relate to the selections of the dimensions for the cylinders and the apparatus for increasing the power of the engine at starting. As a rule the cylinders have been too small for the work to be done, and the starting apparatus has been too complicated. On the whole, we ought to be much pleased with the success of the compound locomotive in this country, and no one need hesitate to take up their use provided that reasonable care is exercised in the selection of the designs of cylinders and starting gear. The other parts are the same, or should be, for the ordinary as for the compound engine.

COMPOUND.

The Elevated Railroad Cases in New York.

(Continued from Page 61.)

BY J. F. WOOD, ESQ.

THE PROSPECTS OF ABUTTING OWNERS RECOVERING DAMAGES AS AFFECTING ANY NEW RAPID TRANSIT SCHEME.

The effect of the Bohm and Somers cases (Ct. of App. not reported) is, all things considered, more far reaching than any decision since the Drucker (supra). These cases will have the effect to make almost all the land damage cases above Fifty-ninth street of little value, because it can be shown in all these cases that the elevated railroad has been one of the principal causes of the increase in value of property in that locality. The court thoroughly sifts the theory of "damages" and holds that it is the consequential or final net damages which the road is bound to pay after the general benefits have been offset. The theory that the railroad has cut out a "block of air and light" for which it must pay as for any solid commodity "taken" is exploded. The easements so taken are of no value by themselves but only as "appurtenant" to the land, and this taking can result thus only in "consequential damages." Defendants now will have to prove merely the enhanced value of the property to destroy "damages" (previous to this decision, enhanced value seemed to play but an unimportant part in the question) and any inquiry as to the amount of loss that might otherwise have been occasioned (if there had not happened to be the actual benefit) would be the purest guess and speculation. The Newman case, 118 N. Y. 618, is not overruled, but is recognized as authority, its reasoning followed, and its application enlarged.

It is safe to say that the Somers case is one which will have a material influence upon the organized "raid upon the treasury of the defendants" (see opinion of Peckham, J.), and, like the decision of Pryor, J., in the Brush case, points to a more sane and just measure of damages against a railway system which has, in a measure, solved the problem of rapid transit. Harlem property, as a rule, has been "enhanced" by the railway, and hereafter it will be difficult for an abutter north of Sixtieth street to show a material loss sufficient, under the Brush case, to sustain an injunction.

The effect of the decision is to throw upon plaintiffs, in all cases, the burden of proof as to how much net damage has been sustained; and the owners of property below the Park will be compelled to recognize this rule, and cannot rest when they have proved the existence of the railway and its physical effects. Courts can no longer assume injuries which, by the actual proof of rents and values, do not exist. In other words, the mere presence of the elevated railroad is not enough to warrant a finding of damage.

Judge Peckham's opinion, concurred in by five judges, goes on to state:

"It is said the lot owner is himself entitled to the benefits accruing to him from the general rise of property caused by a general growth of the city in that vicinity and that the causes of such growth are too indefinite and uncertain, and problematical to permit the railroad to take advantage of it upon the question of damages. Of course the lot owner is entitled to the benefits arising from these sources. I propose to take no course which shall rob him of them. None other ought to or in fact can have them. It is not a question of permitting the lot owner to have these benefits. How is he despoiled of them when upon an inquiry whether he has sustained damage from the conduct of the defendants it clearly appears that he has not? If it appear that he would have sustained damage but for the fact that the general growth of the city in that direction prevented it and caused an increase in value, what materiality lies in the fact that this growth was not caused by the railroad? As I have already remarked the fact that there has been no damage is the material fact, and not the reasons which in truth prevented the injury from occurring. If it did not occur, then clearly the lot owner has suffered nothing. He receives all the benefits attaching to the general growth of the city which causes the enhancement in value of his own lots, but he is not permitted to recover from defendants alleged damages which in fact he has never sustained.

"In the other view what is to be the rule or measure of damages which is to prevail? Is the owner to be permitted to recover as damages the amount which it

is guessed at or surmised he would have sustained by the depreciation in value of his land if it had not been for the fact that it had in truth increased in value? What semblance of justice would there be in such a rule? The only possible injury which the defendants could cause him by their action lies in the injury they might do his remaining land. An investigation of that question reveals the fact that this land has actually increased in value since the taking spoken of and the fact is not claimed or proved that it would have increased as much but for such taking, and yet by a course of what may be called abstract reasoning the defendants are to be compelled to pay such a plaintiff an amount of money as representing damages he never suffered. Any reasoning, abstract or otherwise, which permits such a result, is lame somewhere.

"The defendants are not, however, compelled to base their claims of exemption upon quite so broad a foundation. They say it appears by the uncontradicted evidence that the railroad largely caused the increase in value of all lands on Second Avenue, including the plaintiffs' lots, and as I have said the evidence bears out such claim. If this be the fact, how can it be said the plaintiffs have suffered damage? There is no shadow of evidence that if the defendants had not taken this property and built their railroad, the property of the plaintiffs would have been as valuable or anything as like as valuable as it is. The plaintiffs have in truth been specially benefited by this railroad, although quite a number of others have also participated therein. This special cause is the railroad and a special benefit may result from such special cause. The fact that the other property in the vicinity and in the side streets has been more than proportionately increased in value by reason of the existence of the defendants' road is not of the slightest importance upon the question of whether the plaintiffs have been injured by defendants' conduct.

"The probability is very high that the property in the side streets would have been immeasurably below what it is now in value but for the operation of these elevated roads. The same high degree of probability exists in regard to the property on Second Avenue, as is gathered from the evidence of witnesses in these cases. It is, however, abundantly clear from the evidence abundantly given that the property of plaintiffs has not suffered injury or damage by the wrongful acts of the defendants, and where the plaintiffs have in fact sustained no loss it is no hardship which prevents their recovering anything from defendants. The plaintiffs upon a new trial and under this view of the rule of damages may, perhaps, be able to show they have nevertheless suffered damages from the illegal action of defendants. It is only necessary for us in this case to decide that if the property of the plaintiffs have increased in value since the taking of these easements or a portion of them, and if such increase is largely due to the building and operation of the defendants' road, and if such increase would not have been greater but for the action of defendants, then the plaintiffs have suffered no damage. Whether the increase is common to every other owner in the avenue, and is greater in proportion with some owners of property in the side streets than with the plaintiffs are matters of no importance. The plaintiffs are not damaged because their neighbors are benefited to an even greater extent than they are by the defendants' road.

In the affirmance of Judge Pryor's decision in the Brush case (by the General Term of the Common Pleas) the same idea of the need of proving damages is further borne out. In this case no damages can be awarded where the property is shown to have risen in value.

Finally we approach the question, how much will a new underground or overground system have to pay to the abutter? So far the elevated roads have been forced to pay over \$4,000,000 in damages for taking the "incorporeal, unsubstantial hereditaments," as they are called, of light, air and access in the streets, and the suits for damages have hardly begun. A thousand cases are on the court calendars to-day claiming \$100,000,000 of damages. A dozen suits are being tried every day by commissioners, referees, courts sitting in equity, and with juries. When it comes to digging a tunnel and actually interfering with vaults, pipes, foundations, etc., will not the damages be proportionally greater than for taking the "intangible easements?" It may safely be said that the Court of Appeals will hardly follow the law of vaults as ruled in the Potter case (supra). But if they did finally hold that vaults in streets owned by the city were only on sufferance and by "revocable license" and so subject to public right, yet the question of foundations remains and of interference with pipes, etc. The stations, which must be numerous to accommodate local traffic, will give the abutter considerable annoyance. It is a fair presumption that under the existing favoritism shown the abutter, the courts will find some ingenious means of awarding him damages wherever it is shown that he has in the remotest degree suffered any injury. The evidence of damage underground will be even more untrustworthy than that on which the abutter founds his claim against the elevated structure. It will be difficult in many cases for the defense to obtain any disproof of damage. It is not the actual facts which we are to consider as the legal presentation of facts and the probabilities of recovery. It may be safely said that a well built tunnel through the middle of a wide street cannot presumably injure the abutter to any extent; but if the abutter comes into court prepared with his tenants and experts to swear to vibration and the consequent danger to his entire structure, how is he to be met? It may be that the elevated litigation will at last open the eyes of courts to the vast amount of perjury upon which the heavy damages are sometimes awarded against the road, and that the abutter of an underground system will not share so greatly the pity and friendliness of the judiciary. But we have stated one great source of danger—the difficulty of disproving his statements, without which courts are bound to find in the amounts claimed.

The reasoning in the Patten case (3 Abb. N. C., 315) of Judge Daly at special term is that

"The vault beneath the sidewalk which is connected with and forms a part of the building erected upon the

plaintiff's land, and which has been in existence over 60 years, is the plaintiff's private property, being in no way essential to nor interfering with the use to which the street is devoted as a public street, and his right to the use and enjoyment of this vault cannot be taken away, impaired or interfered with except by authority of law. The construction of a railroad over the surface, or beneath, or above a street, is not such a use as a street is necessarily subjected to (citing *Wager v. Troy Union Railroad*, 25 N. Y., 520), for such roads can be, and in certain cities are erected upon land bought for and exclusively used for that purpose. "The defendants have broken through plaintiff's vault, and are evidently about to make use of it for the erection of their structure," etc.

The General Term reversed Judge Daly, and said, per Robinson, J.:

"The plaintiff is the owner of three lots on the westerly side of Greenwich street, between Cortlandt and Dey streets, upon which he has a building. The defendants entered upon the westerly side of the street in front of plaintiff's premises and broke in a vault."

"This act constitutes such a nuisance as is ground for special damage unless the acts of the defendant are justified by law (Knox v. Mayor 55, Part 404.) The Court then shows that Greenwich street belonged to the city, and goes on to hold "Whatever be the title of the owners of land fronting on the streets in this city, the streets, with scarce an exception, are owned by the corporation, subject to all such uses for public purposes as the legislature may determine to be proper and expedient. No exception to such use can be taken by any person, whether owner of the adjoining building or otherwise, who has constructed a vault under the sidewalk in the street." Under the maxim, *Nullo tempore occurrit reipublice*, the length of time the vault has been occupied makes no difference. The vault becomes a public nuisance if it interferes with the railroad, and may be removed, as private enjoyment must yield to public use."

This line of reasoning is correct were it not that the *Story*, *Lafr*, *Drucker Kane*, etc., cases since decided, pursue the theory that private property if taken must be compensated. Here the abutting owner certainly lost something by the invasion of the railroad, and the Court of Appeals will probably decide that "something" whatever it was, must be paid for on the general theory before stated. The Common Pleas General Term were obliged to consider the vault a "public nuisance" before they could make it subject to the public right vested in the railroad. Whether right or wrong, the Court of Appeals will probably not follow their reasoning.

In case of a viaduct through the middle of a block is built, such as now exists in Berlin, and parts of Paris, the land will be purchased outright—condemned under the right of eminent domain, and the right to cross streets will be granted by statute. There will still exist the omnipresent abutter, however, and under the decisions, the owner of houses adjoining the viaduct will doubtless be able to recover heavy damages.

The fundamental trouble with the *Story* case (30 N. Y., 122), the *Lafr* case (104 N. Y., 270), and the rules of damages laid down for the elevated railroads, is that they are decisions opposed to the progress of the solution of rapid transit. Investors are not fond of law suits. It would be invidious to suggest at this late day that the courts of this state have, in seeking to do justice to individual rights, overlooked the rights of the general public; for a few individuals the many are to be made to suffer. New York City is to-day suffering for the want of additional rapid transit. The elevated railroads are found to be inadequate, and the power of the press seems at present to be on the side of those opposed to allowing a third track, or any increased facilities to be built. But what scheme which ordinarily would attract capital will attract it into a series of interminable law suits with abutting owners? To be sure the Court of Appeals may decide that an underground system beneath a street is not an "improper use of the street," and, as in the *Fobes* case (121 N. Y., 505), in case of steam surface railways in streets hold that no easements are "taken" or "invaded." But where foundations would be actually imperiled and vaults invaded, certainly more tangible rights would be injured than the mere easements of light, air, etc., for which the courts award such heavy damages against the elevated railroads, and the conclusion is irresistible that such new company will find it difficult to attract private capital until it can show a waiver of all claims on the part of abutting owners. Such capital may be obtained from the city, but, as "politics" would be certain to enter into this, it is doubtful whether such a scheme would in any sense meet with the popular assent.

The best plan for those interested in rapid transit to follow is to obtain from the abutting owners, as far as possible, a consent to build the road. This consent will be obtainable in a majority of cases along business streets. Uptown, condemnation proceedings before the road is built will probably satisfy both sides. The city government could contract with some responsible corporation to build and equip a viaduct. The problem is a difficult one, but we are satisfied will be worked out on the lines already begun, viz.: elevated structures. The exact damages to be recovered by an abutter on these roads is proximately known. Promoters may be able here to figure on an exact basis.

Improvements at Mantua Junction.

The drawing herewith shows a plan of the improvements now under construction by the Pennsylvania Railroad at the south leg of the Y at Mantua Junction, West Philadelphia, to avoid the inconveniences of a grade crossing of busy passenger lines. At this junction

the two passenger and two freight tracks of the Philadelphia division (westward from Philadelphia) and the similar tracks of the New York division (northward) unite, running into the line which extends southerly to Broad street and the Junction railroad, which latter is the connection with the Philadelphia, Wilmington & Baltimore. Aside from the inevitable complications incident to handling the enormous number of freight trains at this point, the delays to passenger trains have come to be very numerous, a passenger train from New York to Philadelphia being always liable to be stopped at the crossing to wait for one from Philadelphia to Pittsburgh, or vice versa. This determined the company to run one of the lines underneath the other, and the work has now been in progress for a year. It will not be completed for some time yet, and the whole cost will be somewhere near \$250,000.

The overhead bridge for Thirty-fourth street was completed some months ago, and the under passage for the two New York Division passenger tracks is now being made. The seven freight tracks and one passenger track which are to go over this bridge are so connected by cross-overs that a number of them can be temporarily discontinued, and this is done, the traffic being concentrated on, say, three of the tracks, to such an extent that the bridge, which is of masonry, can be constructed half at a time without the employment of any temporary trestles for the tracks that are in use.

It will be observed that there are no crossing frogs whatever for the passenger tracks, the junction (the

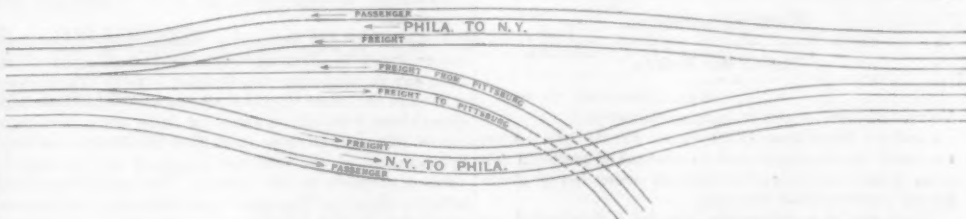
in bulk in buckets, dump cars or pockets, which latter method will prove just as accurate as scale weights in the long run.

The methods in use for coaling locomotives consist of:

1. Shoveling directly into the tender from cars placed alongside the engine;
2. Handling by crane and buckets;
3. Platforms at about the height of the top of the coping on tenders.
4. Chutes at high elevation, either dumping sideways into the tenders or from an overhead bridge spanning the tracks.
5. Special systems, usually patented.

1. The method of shoveling directly from cars into tenders, requiring no special structures or appliances, is the most primitive method for supplying coal to locomotives, and is, naturally, only employed in connection with a very small output, or in case of necessity as a makeshift, or on new work until permanent arrangements are perfected. The total cost of handling is represented by the cost of one shoveling of the coal, or probably about 10 to 15 cents per ton, provided the coal is not frozen in the cars.

2. The method of handling coal by crane and buckets consists of loading iron buckets with coal from storage piles or directly from cars, and swinging the buckets over the tender, as required, by means of a crane, the contents being dumped into the tender either by tipping the bucket or by opening trapdoors in the bottom of the bucket. The system can be subdivided according to



JUNCTION OF TWO-TRACK FREIGHT RAILROAD WITH FOUR-TRACK PASSENGER AND FREIGHT RAILROAD, WITHOUT CROSSING FROGS.

Sketch of plan adopted at Morrisville, Pa., Pennsylvania Railroad.

switches are at the extreme right of the cut, near the point marked 50 being arranged on the principle shown in the small illustration, which is that adopted at Morrisville, Pa., the eastern terminus of the Trenton Cut-off, and at the western terminus of the same, near Downingtown. The Trenton Cut-off, being intended to be used chiefly for through freight trains, is connected directly with the freight tracks of the main line. The smaller illustration is not drawn to scale, as it is shown merely to illustrate the principle. It will be understood that the branch tracks can cross the two main-line tracks either by an under or an over bridge, according to the topography of the locality.

Buildings and Structures of American Railroads.

NO. 15.—COALING STATIONS FOR LOCOMOTIVES.

BY WALTER G. BERG.

This article will be confined to a discussion of the methods in vogue for coaling locomotives, which investigation is rendered somewhat difficult owing to the large number of systems that have been adopted in practice to meet varying conditions and the individual views of railroad officers in charge of this branch of the service. The choice of a design will depend to a large extent on the topographical features of the locality, the ground space available, its shape and its value, the number of engines to be coaled in a given time, the kind of cars in which coal is to be delivered at the coaling station, the quality of the coal, whether hard or soft, and whether the coal will be supplied regularly all the year around, or only at certain seasons of the year; also whether coal is to be delivered to engines on a side track with ample time allowance for coaling, or whether trains will stop to take coal on the main tracks, making a quick coal delivery a prerequisite.

Ample provision for storage facilities is necessary wherever an irregular or intermittent supply is to be expected, caused either by possible labor troubles, temporary suspensions at the mines, or blockades on the road. On Northern systems it is very desirable to store the bulk of the winter's supply before the full severity of the season sets in. In Northern climates it will also prove economical to put a shed or roof over the pockets or storage piles so as to prevent the coal from getting thoroughly drenched and freezing to a solid mass.

In designing a coaling system one of the main points to observe is to limit the number of handlings of the coal, so far as possible, thereby reducing the cost of operation and especially the breakage. Due regard should be paid to having some means for ascertaining and tallying the amount of coal delivered to engines, either by actual scale weight or by measurement

whether a stationary crane with a swing jib or a traveling crane is used, the latter consisting either of a traversing crab on fixed end trestles or of a so-called Goliath crane in which the side supports of the overhead bridge travel on tracks laid on the ground. The use of the bucket and crane system is more particularly employed where coal is delivered in flat cars and it cannot be dumped, but has to be shoveled out anyhow. The first cost of this system is small, as the storage of the coal is on the ground. It will take from five to ten minutes to coal a tender, the crane being worked by manual labor and the buckets having been previously filled.

Stationary cranes are in use on the Wisconsin Central Railroad, the Northern Pacific Railroad, the New York, Chicago & St. Louis Railway, the Des Moines & Fort Dodge Railway, and other roads. The cost of delivery is reported variously at from 7.5 to 15 cents per ton, including shoveling into the buckets, hoisting and discharging them.

A traveling crane on fixed end trestles is used by the Pittsburgh, Cincinnati & St. Louis Railroad at Columbus, O.; the average length of time for coaling an engine is stated to be six minutes and the cost varies from 6.8 to 9.1 cents per ton, covering all expenses, including repairs and interest on first cost. (See *Railroad Gazette*, 1887, p. 214.)

3. In the discussion of the system of using platforms at about the height of the tender coping it is necessary to distinguish between the methods for delivering the coal on to the platform and the methods of transferring it from the platform to locomotives.

The coal is delivered on to the platform either by horse and cart, or by shoveling from cars standing on the coaling track at the face of the platform, or from cars on a raised track near the rear of the platform and on a level with it. Coal is also delivered on to the platform by dumping from a raised trestling set on top of the platform, generally some distance back from the face of the platform, the height of the raised delivery track being usually from 8 to 9 ft. above the level of the platform. The platform level is usually placed from 10 ft. to 12 ft. above the top of rail of the coaling track along the face of the platform, so that the height of the elevated dumping track above the coaling track is from 18 to 21 ft. The height to climb with the loaded coal cars in this system is much less than required for coal chutes at a high elevation and it is, therefore, frequently given the preference over the latter system.

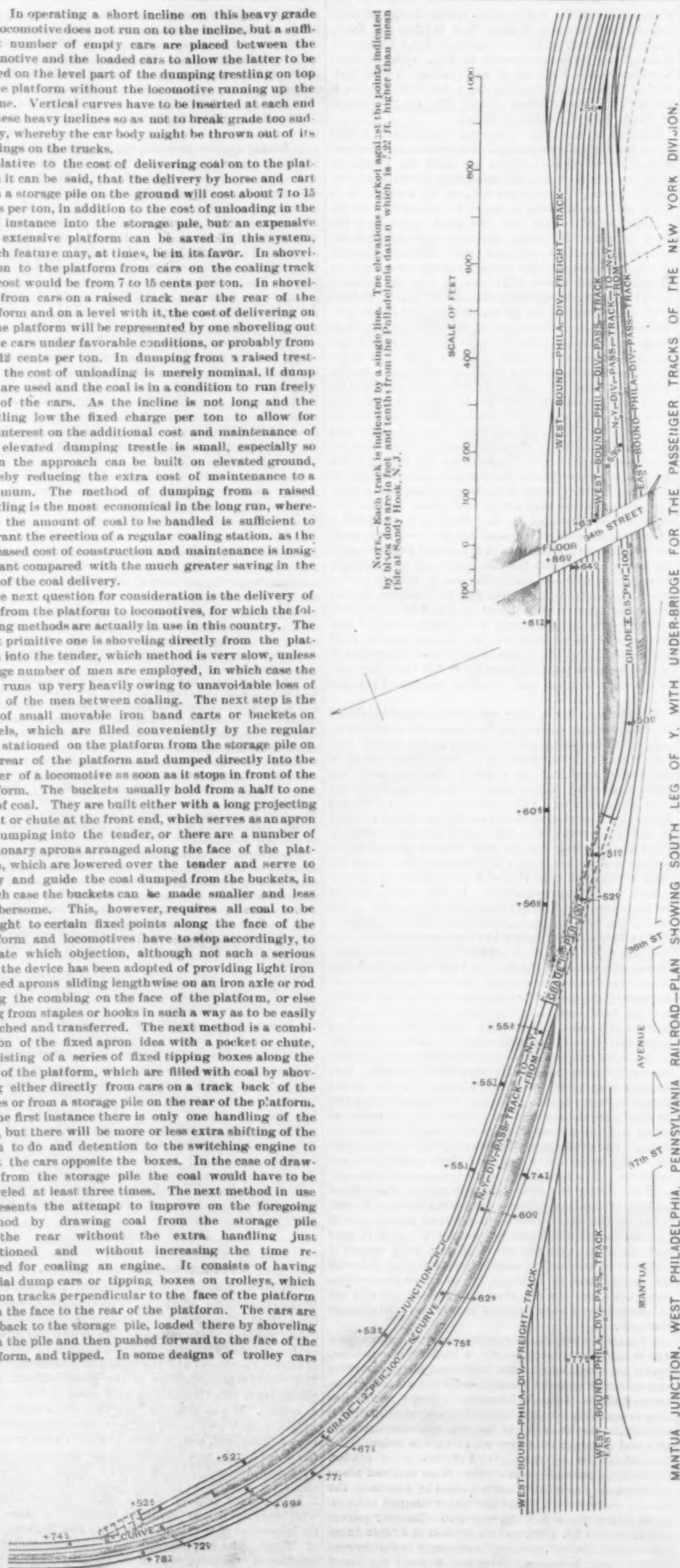
The gradient usually adopted for the inclined approach trestling for the elevated dumping track is from 3.5 to 5 ft. rise per 100 ft. horizontal, which requires an incline of from 400 to 600 ft. in length. Where, owing to want of space, this length of incline is still too great, it is customary to increase the gradient on the incline to 8 ft. (in a few isolated cases even as high as 10 ft.) rise per 100 ft. horizontal, reducing the length of the incline to about 200 to 300 ft., allowing for vertical curves at each

end. In operating a short incline on this heavy grade the locomotive does not run on to the incline, but a sufficient number of empty cars are placed between the locomotive and the loaded cars to allow the latter to be placed on the level part of the dumping trestling on top of the platform without the locomotive running up the incline. Vertical curves have to be inserted at each end of these heavy inclines so as not to break grade too suddenly, whereby the car body might be thrown out of its bearings on the trucks.

Relative to the cost of delivering coal on to the platform it can be said, that the delivery by horse and cart from a storage pile on the ground will cost about 7 to 15 cents per ton, in addition to the cost of unloading in the first instance into the storage pile, but an expensive and extensive platform can be saved in this system, which feature may, at times, be in its favor. In shoveling on to the platform from cars on the coaling track the cost would be from 7 to 15 cents per ton. In shoveling from cars on a raised track near the rear of the platform and on a level with it, the cost of delivering on to the platform will be represented by one shoveling out of the cars under favorable conditions, or probably from 6 to 12 cents per ton. In dumping from a raised trestling the cost of unloading is merely nominal, if dump cars are used and the coal is in a condition to run freely out of the cars. As the incline is not long and the trestling low the fixed charge per ton to allow for the interest on the additional cost and maintenance of the elevated dumping trestle is small, especially so when the approach can be built on elevated ground, thereby reducing the extra cost of maintenance to a minimum. The method of dumping from a raised trestling is the most economical in the long run, wherever the amount of coal to be handled is sufficient to warrant the erection of a regular coaling station, as the increased cost of construction and maintenance is insignificant compared with the much greater saving in the cost of the coal delivery.

The next question for consideration is the delivery of coal from the platform to locomotives, for which the following methods are actually in use in this country. The most primitive one is shoveling directly from the platform into the tender, which method is very slow, unless a large number of men are employed, in which case the cost runs up very heavily owing to unavoidable loss of time of the men between coaling. The next step is the use of small movable iron hand carts or buckets on wheels, which are filled conveniently by the regular help stationed on the platform from the storage pile on the rear of the platform and dumped directly into the tender of a locomotive as soon as it stops in front of the platform. The buckets usually hold from a half to one ton of coal. They are built either with a long projecting spout or chute at the front end, which serves as an apron in dumping into the tender, or there are a number of stationary aprons arranged along the face of the platform, which are lowered over the tender and serve to carry and guide the coal dumped from the buckets, in which case the buckets can be made smaller and less cumbersome. This, however, requires all coal to be brought to certain fixed points along the face of the platform and locomotives have to stop accordingly, to obviate which objection, although not such a serious one, the device has been adopted of providing light iron hinged aprons sliding lengthwise on an iron axle or rod along the combing on the face of the platform, or else hung from staples or hooks in such a way as to be easily detached and transferred. The next method is a combination of the fixed apron idea with a pocket or chute, consisting of a series of fixed tipping boxes along the face of the platform, which are filled with coal by shoveling either directly from cars on a track back of the boxes or from a storage pile on the rear of the platform. In the first instance there is only one handling of the coal, but there will be more or less extra shifting of the train to do and detention to the switching engine to shift the cars opposite the boxes. In the case of drawing from the storage pile the coal would have to be shoveled at least three times. The next method in use represents the attempt to improve on the foregoing method by drawing coal from the storage pile in the rear without the extra handling just mentioned and without increasing the time required for coaling an engine. It consists of having special dump cars or tipping boxes on trolleys, which run on tracks perpendicular to the face of the platform from the face to the rear of the platform. The cars are run back to the storage pile, loaded there by shoveling from the pile and then pushed forward to the face of the platform, and tipped. In some designs of trolley cars

NOTE.—Each track is indicated by a single line. The elevations marked along the points indicated by blue dots are in feet and tenths from the Philadelphia datum which is 7.22 ft. higher than mean tide at Sandy Hook, N. J.



the tipping is done automatically at the face of the platform by the impetus of the car, when pushed against special stops. The cars have either projecting ends which serve as aprons, or they discharge into fixed iron aprons attached to the combing of the face of the platform, or they run out from the face of the platform on a projecting track far enough to be able to discharge into the tender through trap doors in the bottom of the car, which projecting track is hinged and counterweighted similarly to a one-arm lifting drawbridge. The objections to this method of only having transverse tracks on top of the platforms, namely, that a special car has to be provided for each alley and that each car can only be used for coal in its own alley, has caused the adoption of the method with transverse tracks, similar to the one just described, connected however by a track running lengthwise or parallel with the face of the platform. Turntables are provided at the intersection of the longitudinal connecting track with the transverse tracks, or the longitudinal track is sunk into a pit below the level of the platform and serves for a transfer table to work on. In some cases this transfer table is utilized as a scale platform and the coal in the trolley car is weighed while on the table. The style of dump cars and the methods of discharging at the face of the platform are the same as just described for the method with transverse tracks only.

Comparing the different methods for delivering coal to locomotives from a platform, it can be said, that, where speed of coaling is an object, the methods with fixed tipping boxes or with tipping trolley cars are the best, with the preference in favor of the latter method with transverse tracks connected by a longitudinal track, in case the coaling station is a large one and it is desired to offer considerable storage space. Where speed of coaling is not so essential, the small movable handcars will give a cheap and convenient service, and with less first cost for the plant. For temporary work or very small auxiliary coaling stations for use in case of necessity, or for coaling an engine on a small branch where the engine crew has plenty of spare time between runs, the method of shoveling from the platform to the tender is admissible.

Relative to the total unit cost of storing and delivering coal to locomotives over platforms, it is dependent to a large extent on the daily output and the wages paid for labor. The Roadmasters' Association in 1885 adopted a report on "Handling Coal for Locomotives" in which it is stated that the replies received to a large number of letters of inquiry sent out, indicated that the maximum price for hauling coal over platforms of different constructions was 30 cents per ton, the minimum 11 cents per ton, with an average of 19.4 cents per ton. In the report on "Coal Delivery to Locomotive Tenders," adopted by the American Railway Master Mechanics' Association, in 1887, it is stated that on the Burlington & Lamoille Railway the cost of shoveling from a platform at level of footplate, delivering 30 tons per day, including measuring, but exclusive of delivery of the coal on to the platform, was 10 cents per ton; while on a Canadian road the cost of shoveling from car to platform and from platform to tender ran up as high as 34 cents per ton, where the output was small and the coal badly frozen. The same report states further, that on the Connecticut River Railway the cost of delivering 45 tons per day from a platform with trolley dump cars was 14 cents per ton, and on the New York, Chicago & St. Louis Railroad, with the same system, the rate was eight cents per ton for 74 tons daily; on the Northern Central Railway the cost was only 4.6 cents per ton during the winter months for a daily output of 57½ tons, delivering the coal on to the platform from a dumping trestle and delivering to locomotives by tipping trolley cars running on transverse tracks. From data collected by the writer the cost on the Lehigh Valley Railroad of dumping coal from a dumping trestle on a platform and delivering it by means of small handcars to locomotives is about 5 to 10 cents per ton at the coaling station at Lehigh, Pa. The cost on the same railroad for shoveling coal from cars on to a platform at Jersey City, N. J., is about 7 to 9 cents per ton, and the total cost for shoveling from cars to the platform and then shoveling from the platform into the tender is about 13 to 15 cents.

4. Chutes at high elevations offer the advantage of coaling engines rapidly. They are either arranged to dump sideways into tenders on a coaling track running along the face of the chutes, or to dump from an overhead bridge spanning a number of tracks. The next most important characteristic is the method adopted for elevating the coal to the proper height to be dumped into the chutes or pockets. One method is to convey the coal from cars or storage piles on the ground by horse and cart up a proper ramp to the pockets. Another method, and the one most generally in use, is to have a long inclined approach on trestling or on high ground where the locality permits it. Where there is no space for a long inclined approach, a stationary engine with cable rope is employed and the loaded cars are hauled up a steep incline or plane, as it is called. Another method is to fill small cars from a low dumping trestle and then to haul the small cars up an inclined plane to the proper elevation to allow them to be discharged into the high chutes. Another method is to store coal on the ground in bins or piles and fill small trolley cars by hand from the storage piles on the ground level and then hoist the cars on a small platform elevator to the

upper tier, where they are discharged into the chutes. A modification of this latter system, that is feasible and will probably be introduced in the near future, consists of increasing the size of the platform elevator and hoisting up the standard gauge loaded cars in which the coal arrives, thus avoiding one handling of the coal, but of course with the objection of having to furnish a very powerful and heavy elevator. Another method, applicable where there is no space for a long incline or the other methods described are not desired, is to dump the coal into a pit underneath the track on the ground level, and then to convey it by a continuous bucket belt elevator or a trough conveyor to the upper tier, where it is distributed to the different bins by spouts, or by small tramcars, or by the so-called automatic railroad system, or by a horizontal belt or trough conveyor.

After the coal has been hoisted to the proper elevation for discharging into the chutes or pockets it may be dumped from the elevated track on to a platform below it and level with the top of the pockets, or dumped or shoveled directly into the pockets. Then there are designs where the coal is dumped into large hopper-shaped storage bins, which are trapped off at the lower end, allowing coal to be discharged, as required, into regular chutes placed below the bins; this system requires extra height for the supply tracks, but it avoids all shoveling of the coal. Wherever the coal is elevated in small trolley cars it is usually discharged directly into the pockets. A peculiar combination of the high chute and low platform system is in use in a number of the older and in some more recent designs for coal chutes, in which the coal is first discharged from a high track into pockets, which are trapped off at the lower end, so as to regulate the feed. Small trolley cars, which run on tracks on a platform about 11 to 12 ft. above the coaling tracks, are placed under the pockets, filled and discharged over the side of the platform or run out on a projecting counterweighted platform, the same as described above in connection with the platform system. These cars serve also for the purpose of measuring or weighing the coal.

The height of the elevated dumping track above the ground level differs according to the variations in the design, as just outlined. In the case of dumping from an elevated track on to a platform level with the top of the pockets or side chutes, the height of the dumping track is from 25 to 33 ft. above the ground. Where no provision is made for storage and the coal is to be dumped directly into the pockets, the height of the high track is not less than 22 ft. above the ground, and where the coal is to be shoveled off the cars sideways into the pockets the height of the high track is from 12 to 15 ft. above the ground. Where the coal is dumped from an elevated track above a storage platform, which is level with an overhead bridge system, the height of the high track is from 28 to 32 ft. above the ground. In general the top of the pockets for side chutes is from 18 to 23 ft. above the coaling track, and the floor of an overhead bridge is usually from 22 to 24 ft. above the tracks passing under it.

The height to which the coal has to be lifted having been determined, according to the system selected for the storage and delivery of the coal to locomotives, the next question to settle is the method to adopt for elevating the coal. With vertical platform elevators, bucket belt elevators and trough conveyors, the yard space required for the coaling station is reduced to a minimum and a slight additional lift, so as to provide better facilities or storage at the upper elevation, can be easily introduced into the system. Where inclined planes are used the gradient of the plane ranges from 18 to 22 ft. rise per 100 ft. horizontal. Inclined approaches with locomotive gradients, on trestling or on high ground or on both, for reaching the high track of a coal chute system are too long to be worked with a partial train of empties, as done on low grade dumping trestles, and the momentum of a train acquired by taking a "run" is not sufficient to carry the train up. Hence the allowable gradient is limited to the safe grade for a locomotive to run on, and in practice the gradient on a high coal chute inclined approach has been limited to 5 ft. rise per 100 ft. horizontal. Where possible the gradient should not exceed 4 ft., especially in Northern climates where the rails are frequently in a very bad condition in winter. The following railroads have long coal chute inclines with gradients as indicated, namely: Richmond & Alleghany Railroad (Chesapeake & Ohio), 3.75 ft.; Richmond & Danville Railroad, 3.6 ft.; Northern Central Railroad, 3.25 ft.; Lehigh Valley Railroad, at Lehigh, Pa., 4 ft., and at Wilkesbarre, Pa., 5 ft.; Pennsylvania Railroad at East Tyrone, Pa., 5 ft.; New York, Lake Erie & Western Railroad, 4 ft.; Wabash, St. Louis & Pacific Railway, 3.75 ft.; Northern Pacific Railroad, 3.5 ft.; Atkinson, Topeka & Santa Fe, 3.77 ft.

The detail design of the pockets or chutes varies according to whether the chutes dump sideways or lead down from an overhead bridge. The capacity of the pockets varies from 2 to 7 tons, the aim being usually to allow the entire coal supply required by an engine to be dumped in one operation into the tender. The following railroads have chutes with the angles of inclination from the horizontal as indicated, namely: Chicago, Rock Island & Pacific Railway, 34 deg. (Clifton chute); Baltimore & Ohio Railway, pocket 55 deg., apron 37 deg.; Michigan Central Railroad, 33 deg. (Kerr chute); Cincinnati, New Orleans & Texas Pacific Railway, 45 deg. (Kerr chute); Chicago, Milwaukee & St. Paul Railway,

30 deg. (Kerr chute), and a more recent design 38 deg.; Grand Trunk Railway, 36 deg.; New Orleans and North Eastern Railroad, pocket and apron, 45 deg.; Richmond & Alleghany Railroad, pocket 40 deg., apron 30 deg.; Northern Pacific Railroad, 45 deg.; Lehigh Valley Railroad at Wilkesbarre, Pa., 22½ deg.; Atchison, Topeka & Santa Fe Railroad (Clifton chute), 27½ deg.; Wabash, St. Louis & Pacific Railway, 48 deg.

Relative to the cost of coaling engines over a high chute system the Roadmasters' Association report of 1885 stated that where coal chutes are used the maximum price per ton is 9 cents, the minimum 4.5 cents per ton, and the average 7.4 cents per ton, or an average of 12 cents per ton in favor of chutes as compared with the average cost of coaling over low grade platforms; the time consumed in taking coal from high chutes is one minute and from other devices twelve minutes, a saving in time of eleven minutes for each engine coaled in favor of chutes; and where 3,000 tons of coal are handled monthly an annual saving is realized of nearly \$4,500—over other devices. In the report on "Coal Delivery to Locomotive Tenders" adopted by the American Railway Master Mechanics Association in 1887, it is stated that coal is delivered to locomotives over a high coal chute system with long approach trestling and high dumping track on the Baltimore & Ohio, with a daily output of 115 tons, for 4½ cents per ton; on the Michigan Central, with a similar system and a daily output of 175 tons, the cost is stated to be 7 cents per ton, which figure is increased to 8½ cents per ton, if allowance is made for interest, depreciation, renewals and repairs at the rate of 20 per cent per annum of \$4,000, the first cost of the system of 40 chutes; on the Chicago & Eastern Illinois, with a daily delivery of 230 tons over a high coal chute system, the average cost is stated to be 3.78 cents per ton, which figure is increased to 5 cents per ton, if allowance is made for interest, etc., at the rate of 20 per cent per annum on the first cost of \$5,031 for the plant; on the Chicago, New Orleans & Texas Pacific the cost of delivering coal over a high chute system with drop bottom cars, similar to the Baltimore & Ohio chutes, is stated to be 6 cents per ton in the slackest season with a daily output of only 18 tons, while in the busy season it is less, and the fixed unit to add to the above rate, if the chutes were worked to their greatest possible capacity of 330 tons per day, to allow for interest, etc., would be less than 1 cent per ton.

Where space for a long approach is not available, a vertical platform hoist or inclined plane for small trolley cars, or an inclined plane for taking up the loaded road cars, is used to good advantage. The vertical lifting of the loaded road cars on a heavy platform hoist has never been tried to the writer's knowledge, but it has been recommended by the American Railway Master Mechanics' Association, in the report previously referred to, as being worthy of a trial under certain conditions. For a small coaling station, with limited ground space, the use of a vertical bucket belt elevator offers such decided advantages that it would be desirable to see this system used more frequently. At the coaling station for locomotives and boilers for stationary engines in the yard of the National Storage Company, at Communipaw, N. J., a bucket belt elevator has been operated at a less cost than would have been required for a high coal chute system, if interest on the first cost and the maintenance of the structure are considered. The breakage of the coal, frequently claimed to be a serious defect of any bucket belt elevated system, has not been found to be a detriment at this point. It should be stated, however, that at the coal chute in question steam is constantly available from the boilers of the adjacent boiler-house, so that the small vertical engine for running the bucket belt elevator is operated by ordinary labor. The use of the trough conveyor system, with and without a storage pile on the ground, has been introduced on a number of roads, and is deserving of more attention, as a most economical and practical system wherever ground is valuable, or the space for a long coal chute approach is not available. The application of the trough conveying system for lifting the coal from the ground to overhead bridges, for coaling engines on the main tracks of a road, is one of the most valuable and recent improvements adopted for supplying coal for locomotives, as it is very economical in operation, provided the daily output is sufficient to warrant the erection of some kind of a coaling station, and, in addition, the valuable land or limited space alongside the main tracks of a road will not be blocked by a long inclined trestle and coal storage platform.

5. Under the heading of *Special Systems*, opportunity will be taken to review, briefly, a number of schemes, mostly patented, which offer individual characteristics, and cannot be brought readily under the classifications adopted above. Collin's Locomotive Hoist, which has been extensively adopted by the Pennsylvania Railroad, utilizes the tractive force of the locomotive to draw its own coal supply in road cars up to such a height, that the coal can be delivered over a chute into its tender. The Dodge Coaling System consists of an inclined plane up which the loaded road car is hauled by a cable to the top of a coaling shed, where the coal is dumped and conveyed by horizontal belt conveyors to whatever pocket it is desired to fill. Dockstadter's System of a "slide dump coal car and oscillating apron" is designed to deliver coal directly from the road car to tenders without the use of shoveling, at a minimum of expense and breakage, the car being run on a low trestling, along the coaling track,

and then tipped sideways; the objection to this system lies in the fact that special cars have to be used to bring the coal from the mines, and that they will have to run back light in most cases. Mention has been previously made of the trough conveying system and of the bucket elevator system, with stationary or swinging buckets.

In case coal is delivered to a coaling station by water, in barges or canal boats, the best method for transferring the coal to the coal chutes or pockets consists of the tipping bucket system, in which the buckets are loaded in the hold by shoveling, hoisted by horse or steam power, and tipped at the proper point by a suitable attachment, so as to discharge into a pocket or storage pile. Where the coaling station is not located immediately alongside of the water front, the use of the Hunt Automatic Railway is clearly indicated. In this system, the buckets are hoisted out of the hold of the vessel, and tipped at the proper height into a large hopper, from which tramcars are filled, which convey the coal to the pockets or storage piles located some distance inland. The principal feature of this design is that the loaded car travels to the dumping point by gravity, while the empty car is brought back to the hopper by the impetus given to the empty car by a heavy counterweight attached to the car by a cable, the counterweight being brought into play as soon as the car has discharged its load. Where the coal supply by water is large enough to warrant it, a vertical bucket elevator attached to a movable leg is used; the leg is lowered into the hold of the vessel, and the coal is elevated and transferred backward to the pockets or storage piles.

Conclusions.—The Roadmasters' Association in the report adopted in 1885, quoted above, showed conclusively that the high coal chute system was to be preferred in point of speed of coaling and of economy over all other known devices for coaling locomotives. The American Railway Master Mechanics' Association in the report adopted in 1887, quoted above, offers the following conclusions on the question of the different methods for coaling locomotives:

"To summarize, it may be said that with regular coal supply from mine in drop-bottom cars, the cheapest and most rapid delivery is by using high central trestle, from which the coal is allowed to gravitate into dimensioned chutes, and from the chutes gravitates into tender.

"When sufficient land cannot readily be obtained for the long ramp (grade) this system requires, the economy in labor and slight injury to fuel is so marked under this system as to suggest the advisability of lifting the loaded mine cars, vertically (by some form of power elevator) up to the level of track on top of the high trestle.

"For a compromise system, where the daily fuel issues are sometimes taken from cars and sometimes from store heap, either the tipping pocket on truck or chute filled by horse and cart may be used, or, if the amount to be stored and lifted from heap be not large, an overhead girder crane will do. If a Goliath crane be used, the storage is practically limited only by the land obtainable.

"For leisurely delivering comparatively small amounts, the platform, or, better still, direct shoveling from car to tender, is as cheap as any manual labor system known; and if it is desired to lessen the time actually occupied in delivering to tender, a hand crane and buckets on the platform will do so with but little outlay and but slight increase in cost over direct shoveling; in fact, if the use of buckets insures the men being steadily kept at work, the cost per ton may by use of crane be lessened."

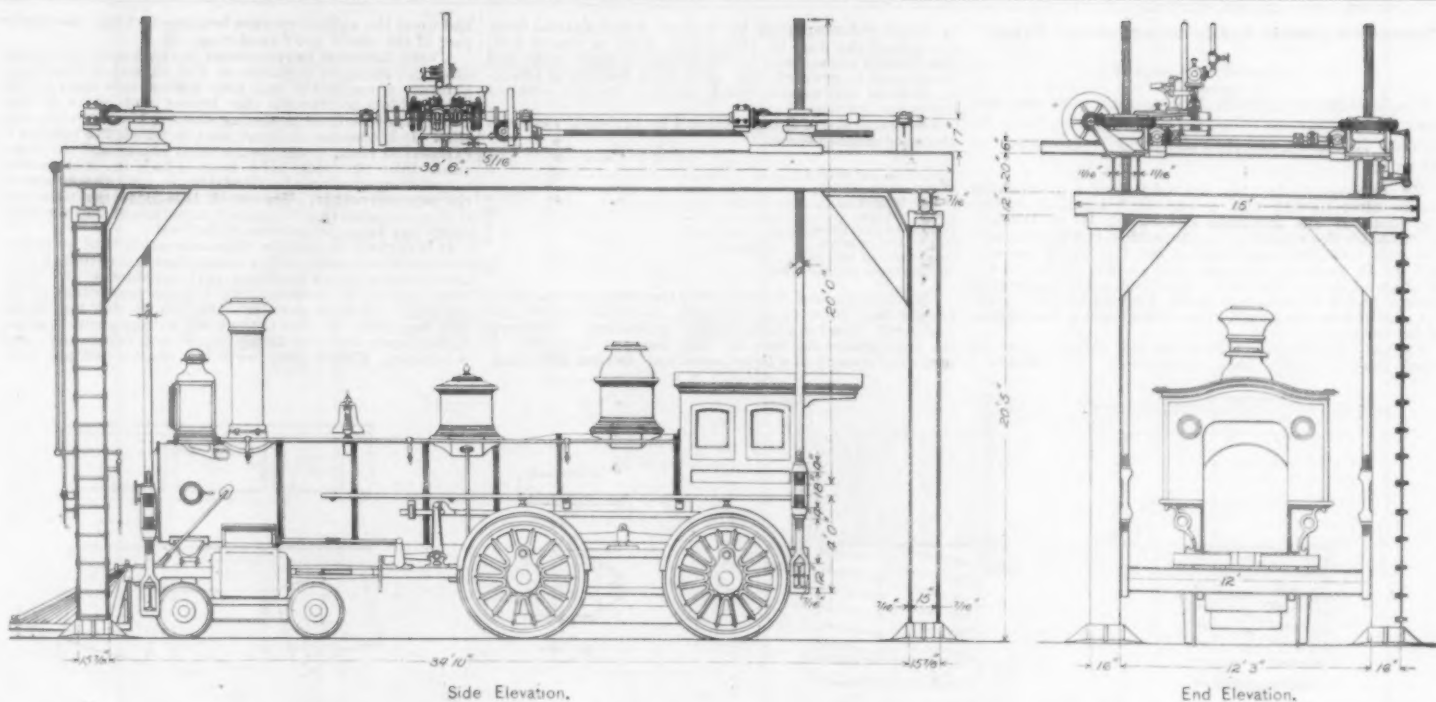
The opinions and conclusions embodied in the reports of the Roadmasters' Association and of the American Railway Master Mechanics' Association, quoted above, can be considered as applicable to the conditions existing to-day. There is, however, one additional feature to call attention to, namely, the lifting and transferring of coal by elevators or conveyors has, within recent years, been adopted with such good results under certain conditions by a number of railroads, that any remarks on the subject under discussion would not be complete without calling attention to the valuable improvements in this class of coal handling machinery, which have been brought prominently to the front since the reports of the associations, mentioned above, were adopted.

Various plans and descriptions of coaling stations for locomotives, as actually in use in this country, will be given in another article.

[TO BE CONTINUED.]

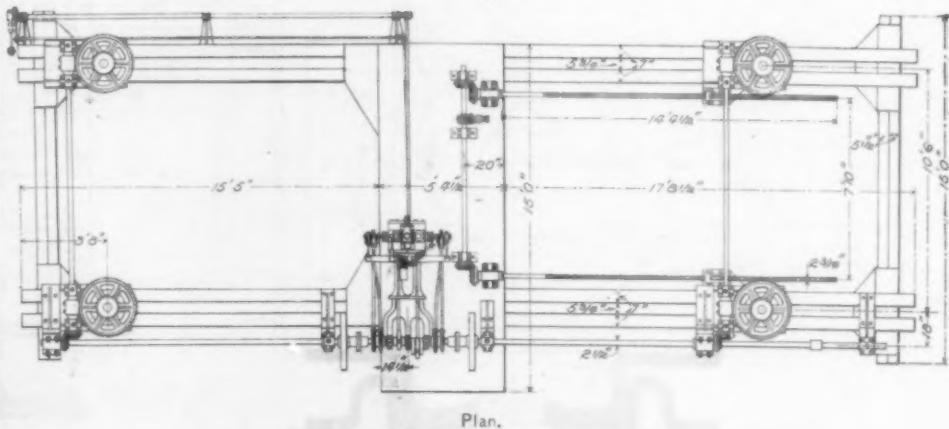
A French Railroad Commission.

Since 1879 there has been in France, attached to the Ministry of Public Works, a "Commission on Railroad Operation" whose duty is to examine questions relating to the working of the railroads, and which has hitherto paid particular attention to a mining into the cause of railroad accidents and the means of preventing them. Heretofore representatives of the great railroad companies sat in this Commission with power to vote as well as debate. It was objected that this often made them judges in their own cases, and now the Commission has been reorganized, and, in order to give it more prestige, the order for the new Commission has been made by the President, instead of the Minister of Public Works, and the latter is made the nominal head of the Commission. It is to consist, besides, of the officer in the ministry who bears the title of "Railroad Director" of those general inspectors of the Corps of Bridges and Highways, or of Mines, who are charged with the government inspection of railroads, and of 16 members appointed by the Minister, one of whom, serving as Vice-President, must be a general inspector of one of the two govern-



Side Elevation.

End Elevation.



Plan.

LOCOMOTIVE HOIST—CHICAGO & NORTHWESTERN RAILWAY.

ment corps named above, three general inspectors or chief engineers from each of these corps, one representative of the War Department, one of the State Railroads and seven experts in railroad operation.

The railroad companies' representatives are authorized to discuss matters which relate to them, respectively, at the sessions which consider those matters. The Vice-President may appoint on commissions to report on special questions men not members of the Commission, and even experts who are not in the government service at all. The men appointed on this Commission, Oct. 17 last, are: Vice-President de la Tournerie, General Inspector of Bridges and Highways; General Inspectors Linder and Lorieux and Chief Engineer Vicaire, of the Corps of Mines; Senator Cuvilot, General Inspectors Menche de Loline and Collignon, of the Bridges and Highways Corps; Major Gouse, of the Artillery, State Railroad Director Cendre, Haton de la Goupillière, Director of the School of Mines and Member of the Institute; Léauté, another Member of the Institute; Raymond, Past President of the Society of Civil Engineers; Caël, Telegraph engineer; the civil engineers Gottschalk and Pontzen, and Professor Bricka, who lectures on railroads at the School of Bridges and Highways. Pontzen will be remembered in this country as one of the authors of Lavoigne and Pontzen's great work on American railroads.

At the first meeting of this Commission, the Minister of Public Works named as principal objects of its efforts at present the prevention of railroad accidents, the uniform training and appointment of locomotive engineers, the perfection of the block system on certain lines, and the prevention of delays to trains.

Locomotive Hoist, Chicago & Northwestern Ry.

A novel locomotive hoist, devised by Mr. William Smith, Superintendent of Motive Power & Machinery of the Chicago & Northwestern Railway Co., at the Chicago shops, is shown in the illustrations. It consists of four upright posts about 20½ ft. long, which carry girders on which travel four crossheads containing a powerful nut which raises and lowers a 4-in. screw attached to the end of which is a stirrup for receiving a crossgirder under the engine, as shown. The whole apparatus is worked by means of a pair of reversing stationary engines, shown in the plan, which drive the large nuts by means of a worm and bevel gear connection.

The apparatus is intended to facilitate the removal of wheels, axles, and boxes, for repairs. The hoist has a capacity of 60 tons with a factor of safety of five, and raises this load at a speed of about 1 ft. a minute. For repairing, the locomotive is run directly under the crane and hoisted, the wheels removed and small trucks placed under it. The engine is then pulled out to a transfer table by means of a capstan and taken to the pit where it is to be repaired. The whole apparatus is inexpensive, and is particularly useful where there are not facilities for using an overhead crane.

Mandrel-Rolled Hollow Staybolts.

Prof. George F. Swain, of the Massachusetts Institute of Technology, has recently made a test of the hollow staybolt iron manufactured by the Falls Hollow Staybolt Co., of Cayahoga Falls, O., with the following results.

"Size of piece, 0.895 inches outside diameter.
"Area in square inches, 0.611 net (deducting hole).
"Ultimate strength in lbs. per square inch of original section, 50,700.
"Limit of elasticity, approximate, 23,000 lbs.
"Area of contracted section, square inch, 0.311.

"Ratio of, reduced to original section, 0.59.
"Fracture, fine grained and uniform.
"The elongation could not be satisfactorily measured on account of the shortness of the specimen, although we spent some time trying to get sufficient distance between clamps. We found an elongation of 41 per cent. in 3½ inches."

We have before described the method of manufacture, which is to wire together two U-shaped bars, bring them to a welding heat and pass them through rolls. As the welded tube comes from the rolls it passes over a mandrel which fills the interior. Before reaching the second pair of rolls it cools slightly and shrinks upon the mandrel. In the second pair of rolls it is drawn from the mandrel and the interior cleared from slag and cinder. In this way, by five repeated operations, a hollow staybolt is obtained which has a uniform interior diameter. This process produces a hollow bolt which is apparently seamless, as is shown by a specimen which has been burst open with a punch and split down on three lines.

These mandrel-rolled bolts have been adopted as standard for the locomotives of a considerable number of roads. The hole is said to be less liable to clog with rust than in drilled bolts, and therefore they are more reliable in detecting breaks and they are also cheaper. Those who have used these bolts say that there is another element of safety besides the one mentioned above, in that the hole drilled in a solid bolt is liable to be eccentric and thus weaken the bolt.

The Falls Hollow Staybolt Company uses Tennessee bloom charcoal iron and supply lengths of about 6 ft. with from ¾ in. to 1½ in. outside diameter, and with any size hole desired, from ½ in. to ⅝ in.

The cuts show the use of the mandrel-rolled bolt and the ordinary form of solid bolt with the tell-tale drilled in it. It will be seen that the hollow bolt is threaded and screwed in in the usual way and then headed over and the opening reamed out at either end, or it may be left closed on the firebox end if preferred.

The Government Accident Statistics.

Mr. Henry Cabot Lodge, in the *North American Review*, argues for legislation compelling the adoption of automatic car couplers. Mr. Lodge represents a class who are naturally and properly concerned about the large number of casualties occurring annually, but who do not go deeply into the subject. His article is based on the statistics reported by the Interstate Commission, which show that 309 employees were killed and 7,842 injured in 1890 from coupling and uncoupling cars. But if we are to make such figures the basis for legislation, we ought to know more about them. Do the injuries from coupling cover only those men who were hurt between the cars, and who were in that dangerous position for the express purpose of attaching the cars to each other? A car might be kicked by the switch engine against another car with such force as to hurt the brakeman, and yet the mechanism used for coupling have nothing to do with the injury. Was the form of coupler really responsible for the injuries supposed to be directly caused by it? Some railroads long ago adopted the rule that brakemen should use a stick provided by the company; but it soon became a dead letter. The switchmen have an unwritten law that no stick shall be used. Any one who does so is a "duffer"—that is, an unskilled workman. This feeling arises from pride in their calling, as highly dangerous and consequently as worthy of recognition and of good wages on the part of the company. Reasoning something like this is the explanation of the paradoxical protest against all automatic couplers entered by the switchmen before the committee sitting in this city last November. So we have the curious contradiction of Mr. Lodge and others pleading for legislation in favor of a class of employees who want none of it. We ought not to stop a needed improvement merely on this account, but the assumed reason for compulsion in car couplers, that lives are sacrificed, loses much of its force when we know that a good part of the sacrifice is unnecessary under present conditions.

The tables of accidents to employees are misleading in another particular. The stress is laid on couplers and air brakes, yet other causes account for most of the casualties. Thus the Commission reports 15 per cent. of the employees killed as due to car coupling, while the English Parliamentary return ascribes some 30 per cent. to the same or a similar cause. Examination shows that the dangers from car service are, in proportion to numbers employed, but a little greater in the United States, and that the large British percentage of the total fatalities ascribed to this cause is owing entirely to a lower percentage for other accidents. Thus train accidents were responsible for 22 per cent. of lost lives among American employees in 1890, and for only 3 per cent. of the fatal injuries in England. Train accidents therefore killed more employees than car-couplers, even adopting the figures as they stand; and in this latter cause the traveling public have also a deep interest.—*New York Evening Post*.

Recent Progress in Car Construction and Design.*

(Continued from page 81.)

The description of Mr. R. P. Lamont's steel car was omitted from our last issue, the cut not having been received. It follows, and then the paper is continued in its order.

Mr. Lamont made this the subject of a graduating thesis after having had a thorough training in the car shops of the Michigan Central R. R. at Detroit. It embodies the results of mathematical calculation and the wide practical experience of Mr. Robert Miller and Mr. E. D. Bonner, who are well known officers of the Michigan Central Railroad. This is a most interesting design, and I am indebted to Mr. Lamont for this valuable addition to this paper. The following is a description of the car:

For the eight wooden sills of the old 60,000-lb. car six steel channels have been substituted. To provide a

in. thick and supported by T-irons which extend from one side of the car to the other with a rise of 6 in. The T-irons are secured to the plates by angle irons and rivets; and to prevent the arch from flattening out $\frac{1}{2}$ in. tie rods are used to bind together the two sides of the car at the top.

The plates are of Z bar section 4 in. in depth with end plates of channel form.

	ft.	in.
Length of car over all.....	36	8
Width over all.....	9	8
Inside length.....	34	8
Inside width.....	7	10
Height of car lines.....	7	8
Out to out of sills.....	8	6
Out to out of end sills.....	8	6
Height from rail to floor.....	45	

Car Trusses and Braces.—The trussing and bracing of freight cars have received more attention in the past few years than for a long period preceding. Formerly the truss under the cars did not amount to much. It consisted mostly of a light truss rod having little cam-

and upon the superstructure bracing to keep the upper part of the car in good condition.

A very desirable improvement in the details of bracing of superstructures is shown in Fig. 13, which illustrates a form of malleable iron post plates, now used by the best builders to prevent the braces and posts of the superstructure from pounding and working into the side sills. It is common in stock cars, in which the bracing is exposed to view, to see the inclined braces and the posts sunk into the side sills from $\frac{1}{4}$ to $\frac{1}{2}$ in. with a corresponding slackness in all of the tie rods and braces of the superstructure. The use of this plate is a necessity if it is intended that the upper structure of the car shall carry any large proportion of the load.

It is curious to note in this connection that an examination of cars built only a short time ago reveals a condition of the upper truss not very satisfactory to those who believe it should carry a large percentage of the car load. In these new cars the braces did not touch the top plate or the bottom sill within about $\frac{1}{2}$ of an inch at each end, and hence could not carry any load whatever. Either they were too short when put in or

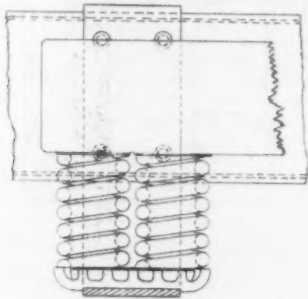


Fig. 20.

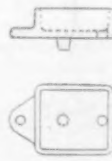
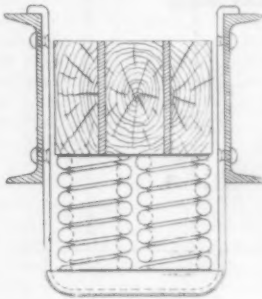


Fig. 13.

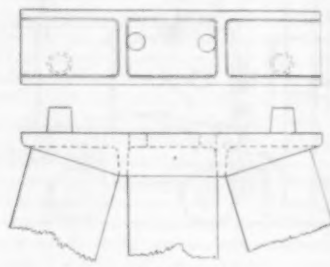


Fig. 14.

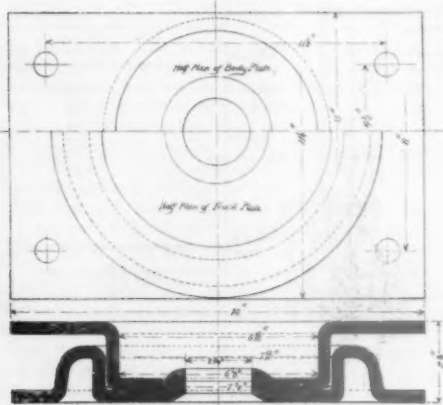


Fig. 16.

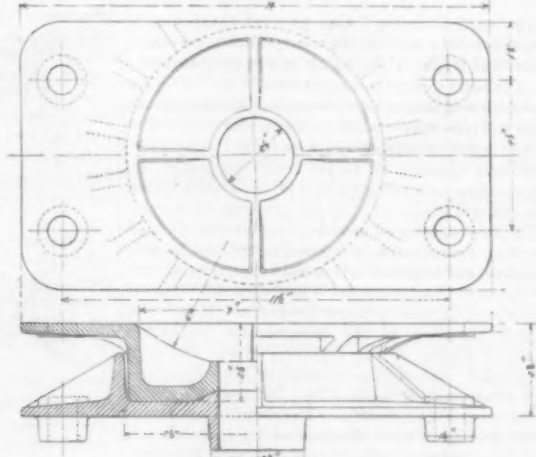


Fig. 17.

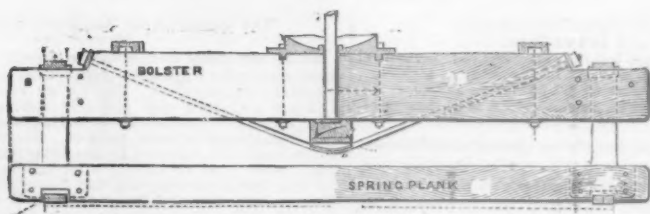


Fig. 19.

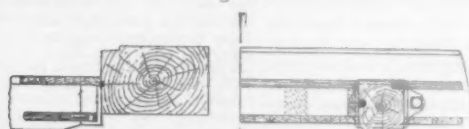


Fig. 14.

DETAILS OF FREIGHT CAR CONSTRUCTION.

With Mr. Barnes' paper on "RECENT PROGRESS IN CAR CONSTRUCTION AND DESIGN."

means of securing the wooden floor to the sills a flange is rolled on the back of the channels near the centre, upon which rests a 2 x 3 in. wood strip, fastened to the sills by bolts at intervals of about 2 ft. There are four $1\frac{1}{2}$ in. truss rods with a camber of $\frac{1}{4}$ in. The draft channels are riveted to the lower flange of the centre channels and extended to the transoms. Narrower channels are riveted to these and extended back through the transoms. Followers are of the usual form and held between lugs formed by bending $\frac{1}{2}$ x 5 in. flat steel around cast iron blocks. The $\frac{1}{2}$ x 5 in. flat extends 12 in. away from the lug, and is securely riveted to the draft channels. The side and end posts are of Z bar section, and connected at top to the plate and below to the sills by angles and rivets. The inside sheathing is of $\frac{1}{8}$ in. pine, and is put together in sections and secured to the Z bar posts by bolts. The outside sheathing is No. 16 Birmingham gauge steel, corrugated and secured to the framing by $\frac{1}{2}$ -in. rivets.

The car door is hung upon two rails, each of which is one-half the length of one, if only one were used. The forward and back shoes are given independent motions, the forward shoe sliding gradually into the recess formed by the Z bar irons until the outside of the door is flush with the outside of the car. The back shoe slides parallel to the side of the car until the door is nearly closed, when it makes a short turn and brings the entire door flush with the side of the car.

The roof is made of corrugated steel about $\frac{1}{8}$ of an

ber and insecurely attached to the end sills, the end attachment being a small washer and nut on the outside of the end sills, with the result that when the car was loaded the washer would sink into the wood and decrease the carrying capacity of the truss rod. With the old form of truss, with little camber, and hence heavy pressure on the wood in proportion to the load, a small washer was used. A $2\frac{1}{2}$ -in. washer under the end of the rod and a 10-in. camber represent the old practice. Now a 4-in. washer on a large iron plate, and a $\frac{1}{4}$ in. camber to the rod is considered good practice. The diameter of the rod has been increased from $\frac{3}{4}$ to $1\frac{1}{4}$ in., with enlarged ends where the screw threads are cut.

There is still much dispute about the bracing of cars, particularly of the box type. Some believe that the whole load should be carried by the side framing of the superstructure, with perhaps some assistance from the truss rods, while others believe that the framing of the superstructure should be used only to brace that structure, and not to carry the load; and, further, that the truss rod, its camber and attachments, should be arranged to carry the entire load of the car. For a given load the truss without the superstructure will deflect, say, 2 in., while the superstructure bracing is so rigid and stiff, by reason of its great depth, that when made sufficiently strong to carry the load it will deflect less than one-quarter of an inch. The two will not work in harmony, and owing to the difficulty of keeping up the bracing in the superstructure, and of the desirability of having uniformity in construction of underframes for flat and box cars, it is better for these and other reasons to depend upon the truss rod to carry the entire load,

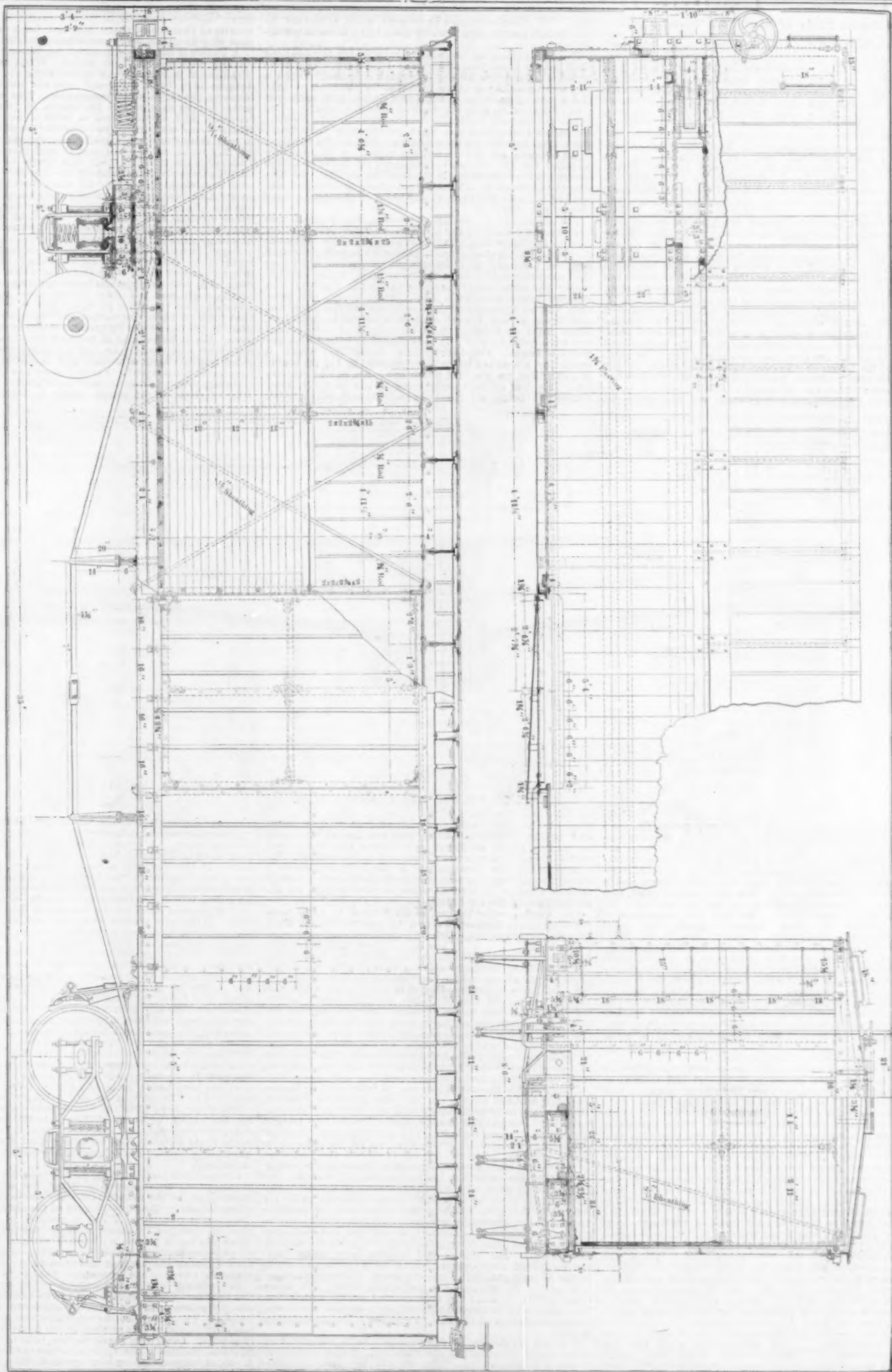
end shrinkage accounted for the opening. The braces were held in position by the lining and the siding which were nailed to them.

End Posts.—A decided improvement in the latest cars is found in the construction of the end posts. The old construction was to make the end posts as shown in dotted section, fig. 14; the new is shown at B in the same figure. Formerly the posts were small and filled in the space between the lining and the sheathing of the car. They then had but little resistance to shifting loads. The new construction shown at B has a post 7 in. thick instead of $3\frac{1}{4}$, and has a metal shoe on the end sill (see fig. 15). The result of this new construction has been a decided decrease of bulged ends.

Centre Plate.—There is no detail of car construction which differs so much in design as the centre plate. Formerly the theory was that a centre plate should have a ball bearing which would enable the truck to adjust itself to the track without moving the car body. The error of this has been shown by experience, and now the prevailing practice is to make a large flat bearing. See figs. 16 and 17. With a spherical bearing the car rolls too much, and on a straight and level track one can generally tell, on a train running at speed, which cars have spherical centre plates. With the spherical plate the car is generally resting on one side bearing or the other, and almost never in a horizontal position. Particularly is this true if the car is not uniformly loaded. The heavier side will always be down on the side bearing. With a flat centre plate the car generally keeps a level position except on curves. One objection offered to a large centre plate is that there is an increase in the

* Paper by Mr. D. L. Barnes, Railroad Gazette, before the Western Railway Club.

LAMONT'S STEEL CAR.
 WITH MR. HARNES' paper on "RECENT PROGRESS IN CAR CONSTRUCTION AND DESIGN."



friction caused by the turning of the trucks on curves; but, while this may be true when only the centre plates are considered, yet the side bearings have more to do with the resistance to the turning of the trucks than the centre plates. With a centre plate of small diameter the cars roll as much as with a spherical bearing and are just as liable to be down on one side, and in this condition there is a greater resistance to the turning of the truck due to the friction of the side bearing than could possibly exist with a centre plate of reasonable diameter.

The result of centre plate friction or resistance to turning of the trucks is found in the increased flange wear

of the wheels and in the increased resistance of the train. Probably more attention is devoted to this matter on the Baltimore & Ohio road than any other. They use a large flat centre plate, which keeps the cars from tilting over until they bear on the side bearing, and all centre plate bearings are greased by means of a long squirt oil can with which the plates can be reached from the outside of the car. The result is to reduce greatly the flange friction and the resistance of the train. It has been estimated that on a road having many curves the use of a proper centre plate well oiled, will increase the average train load for the same locomotive about one car in thirty. This estimate corresponds with the

experience of the Northern Pacific on some crooked, narrow gauge lines where the centre plates were oiled to increase the loads hauled by the engines.

Figs. 16 and 17 show an interchangeable design for malleable iron, cast steel, and pressed steel centre plates. The diameters of the plates are large enough to keep the car from undue rolling or tilting over on the side bearing when it is not uniformly loaded. The rise of the centre of the plate makes provision for keeping the oil from running out through the centre pin bolt hole. It will be noticed that these bearings are probably as light as they can be made of the different materials, and that the top and bottom parts of the

three different kinds of plates are interchangeable.

Trucks.—In trucks the improvements have been perhaps greater than in any other part of a freight car. The side framing has not been materially changed except in dimensions, but the bolsters, spring planks and transoms have been greatly improved. To illustrate the change, I have selected details of two rigid trucks; one of the old and one of the new. Fig. 19 shows the old type with a wooden spring plank and bolsters, the inadequacy of which for modern service is evident. The new bolsters are yet partially built of wood, but they are now composite with iron or steel plates between the wooden slabs, as shown in fig. 20. The plates carry the load, and the wood acts as filling pieces. It has been difficult to see how a purely metal bolster can be made to equal the composite bolster here shown. In the new design the wooden transom and spring planks are gone. Rolled steel channels, securely riveted to malleable or cast iron end pieces, are now used as shown in fig. 21. In this way the trucks are maintained more nearly square than in the old form, and there is much less strain and wear on the vertical bolts which secure the transoms to the side frames. There are lips or projections on the end castings, which keep the truck approximately square without the assistance of the vertical bolt.

One of most admirable features of this design is shown at fig. 20, which dispenses entirely with the spring plank. It consists simply of a wide "U" shaped strap adapted to receive the spring plate at the bottom and with a lip at the top over the channels to carry the load. This may be taken as the best form of modern freight car truck now generally used, and is certainly a marked improvement over the old form.

The most radical proposed change and improvement

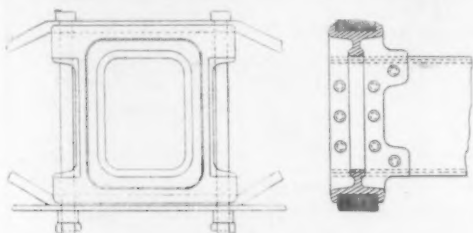


Fig. 21.

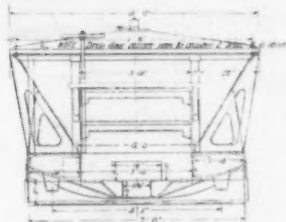


Fig. 23.

in trucks, and one which is not yet generally used in this country, but is commonly used in Mexico and foreign countries, is the pressed steel truck. There are now in use here about 200 on about 40 different railroads. Undoubtedly you are all familiar with the general construction. It has springs over the axle boxes, and is made up of four main parts; two side frames and two transoms. It weighs 3,000 pounds per car less than the average truck now used, and has the advantage of being made of the highest grade of mild steel. [See the *Railroad Gazette*, March 27, 1891.] So far as used there have been no defects made apparent. Its future in this country is, of course, problematical, but its simplicity, cheapness and durability are such as to gain for it a fair trial; and if the results are anywhere near equal to those obtained in Mexico under similar conditions, we may expect that either the form now being tried here, or some other form of pressed steel truck, having few parts well riveted together with large rivets by hydraulic pressure, will become the truck of the future, and will surely follow, if not precede, the introduction of steel under frames.

One of the most marked changes in truck construction is that from rigid to swing motion and the return to rigid trucks for freight service. The swing motion truck was introduced after the period with which these comparisons are made. It has been found unnecessary, and, I believe I am safe in stating, it is now being generally discarded. It was put in at first to make the cars ride more evenly and perhaps more steadily. This did result at low speeds. The swing motion was formerly about one and a half inches each way from the centre. As speeds increased and live stock was carried, it was found that the lateral motion was too much and the cars at speed took on an oscillating motion which made them very unsteady and threw the stock down. Gradually the lateral motion was reduced until it reached about one half inch each way from the centre. It was found that as the lateral motion was decreased the cars became steadier, and it was not uncommon to block the swing motion on stock cars to make them ride better. The cost of maintenance of the swing motion part of the truck was greater than the cost of maintenance of other parts of the framing. Hence, the natural result; the swing motion was discarded by those roads which kept a close watch on the cost of repairs.

Car Wheels.—The improvement in car wheels is decidedly satisfactory. The contracting chill has led the procession of improvement with the result that all wheel makers are now making better cast wheels in both plain and sub-divided chills than ever before, and those who dispute the efficacy of a contracting chill will have to admit that it has forced them to use better material and more care in the manufacture than formerly.

Brakebeams.—One of the most important advances in the details of construction of freight cars, is in brakebeams. All know the old form of beam. Too many of them are now running on new freight cars. It consists of one piece of green timber with a clumsy cast iron head on each end, and a cast iron lever support at the centre of the beam, which is attached by bolts which cut away the material of the beam at the weakest point. The construction is the worst possible, and it is only in this country that such beams have been used to any ex-

tent. All other countries have paid more attention to this detail, and have generally used some form of metallic beam.

The modern metal brakebeam is probably the best we shall get for some years to come. It is formed of a compression member with the material disposed in such a way as to give the greatest stiffness for the least weight and a tension member of any form which has sufficient area of section to give the desired tensile strength. The heads are made of malleable iron or cast steel of excellent design, and weighing less than one-third of the clumsy head used on the wooden beams. When the modern beam is made an initial tension is put on the tension member for the purpose of bringing all parts to a firm bearing before the beam is strained in service. In this way the deflection of the beam when the brakes are applied is made less than it would be if the parts were loosely put together.

The extremes in design of beams, the poorest and best, are now used by car builders and shipped on new cars on the same day. It is curious to see this variation in such an important detail. One road running through a given territory and doing a given class of work uses the poorest possible form of brakebeam, while another under the same conditions uses the best. The use of a wooden brakebeam with an air brake is very bad practice. The adjustment of the shoes controls the situation, and there is not travel enough in air brake cylinders, when used on 50,000 or 80,000-lb. freight cars, to permit any such deflection of the brakebeam as is had with the wooden beam. One-fourth inch deflection, which is small for a wooden beam, corresponds to 1% in travel in a cylinder, an amount much too large to be permissible. The $\frac{1}{4}$ of an inch limit, fixed by the M. C. B. Association as being all that is practicable to allow, is too

there has been some little improvement in the smaller details of these cars, there has not been much change that may be called an improvement in the hopper portion unless it be in the lining of the hopper and all the interior with heavy sheet metal. What is needed for this class of work is a good all metal car, . . . and several designs have been proposed, and are looked upon with favor by the large steel companies. The success of all metal hopper cars on the Baltimore & Ohio is beyond criticism, and should form a basis of design for those who are contemplating the construction of hopper cars. A very satisfactory design of metal ore car is shown in fig. 23. It is entirely of metal and riveted together. This car is intended to meet the needs of a heavy ore trade in the northwest, and has been approved by several steel companies as adapted to meet their needs as to capacity and location and size of receiving packets at terminals. None have been constructed owing to the expense incident to a trial order. The cost of these cars could only be reduced to about \$800 by the manufacture of a large number with special tools.

Small Details.—One of the most radical changes in material for the details of freight cars is that from cast iron to pressed steel, with the alternative of malleable iron. The last two materials are fighting for supremacy; and as each has its own advantages and is better adapted than the other for some details, we may expect that both of these materials and cast steel will find a place in the car of the future and entirely supersede cast iron. The introduction of pressed steel has forced the malleable iron makers to produce better stock, and a decided improvement of design and material in malleable iron parts is apparent. Pressed steel has the advantage of being tough, durable and practically unbreakable, while malleable iron can be made in forms and shapes

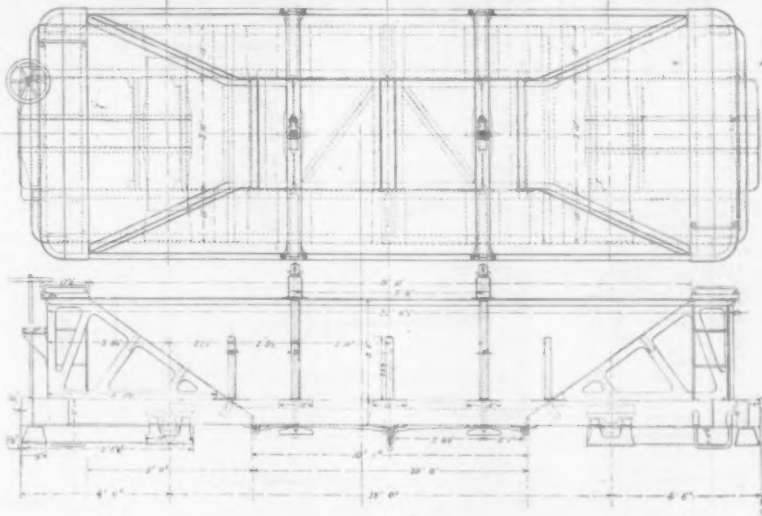


Fig. 23.

DETAILS OF FREIGHT CAR CONSTRUCTION.

small to be easily attained with an iron or steel beam, and beams purchased in the open market will be found to vary as much as 50 per cent. above this limit, even when intended to meet the standard requirements. The differences in the manufacture of the different beams is enough to account for this, and the utmost care is needed to obtain beams as stiff as must be used to gain all the advantages of the air brake.

Car Brakes.—Car brakes, so diversified in type some years ago, have simmered down to practically one kind, namely, a continuous, quick acting, automatic, compressed air brake. . . . It has been shown that in a fifty car train an instantaneous and simultaneous application of the brake at the front and the rear of the train will prevent all shock when the cars are uniformly loaded. We shall have to confess that it is not known what will happen in mixed loaded trains, with the heavy cars at the rear. Without electric connections we cannot expect a simultaneous action at both ends of the train, but the quick acting, compressed air brake now used will operate on the rear of the train with sufficient rapidity to brake and effectually reduce the speed of the rear cars in a uniformly loaded train before they can run into the front of the train and cause a shock.

Considerable increased interest in freight train brakes has been aroused within the last year for three reasons. There is a strong probability that our National government will compel the use of power brakes on freight trains to decrease the injuries to trainmen and increase the safety of passenger trains running on the same or on parallel tracks. Again, the results of the records kept by roads that have used freight train brakes show conclusively that the reduction in the number of wrecks, the increased rapidity with which trains can be handled, and the increase in speed of freight trains, quickly pays for the entire first cost of the power brake and its maintenance. Also, there is a prospect of a competition in the air brake market. A flood of inventions has been sent to the patent office during the past two years on matters pertaining to air brakes, and several new brake companies are offering devices which they claim are equal to the Westinghouse. I use the word "Westinghouse" here partly to designate a particular brake, but more especially to indicate the only type of brake which has been shown to be beyond dispute such as will meet the recommendation of the Master Car Builders' Association in 1888.

It is not my desire to discourage the introduction of other forms of compressed air brakes. To the contrary, it seems desirable that there should be some competition. Yet no one is justified in passing over the important fact that an elaborate series of experiments are necessary in actual road tests to prove that a new brake is safe to use. It is more dangerous and foolhardy to use an air brake without making a complete and thorough test of its action under emergency conditions than is the case with any other detail of car construction, unless it be wheels and axles. A bad air brake and a cast iron axle are about on a level; one is no more dangerous than the other.

Ore and Coal Cars.—Cars for coal and ore service have been but little improved when compared to what is necessary to make them really serviceable. The hopper form will ever remain the favorite with those who seek to reduce the cost of transportation. Now, while

that are desirable and into which steel cannot be pressed

The most radical introduction of pressed steel is for journal boxes. A considerable number of these have been used in England, but not of the form of box used here. In this country a new process of manufacture, and a very ingenious one, has been invented, and pressed steel journal boxes are soon to be offered in the market by a firm which has had much success in the introduction of pressed steel for the numerous details of freight cars. If the new pressed steel box has advantages over the cast-iron box, such must be found in the decreased weight and freedom from breakages.

The results of the use of pressed steel in car construction have so far been satisfactory. Breakages of these parts are almost unknown except in the case of the earlier forms of centre plates. The lighter details have sometimes failed by bending, and some errors have been made by using too thin material. The one point to be careful about in selecting pressed steel parts is the thickness, but the increase in weight per square foot for the plates used in the last year for all this work is probably sufficient for some time to come. On the contrary; in the case of the competing material, namely, malleable iron, the parts have been made too thick, and the reduction that has been made in the thickness of this material has resulted in a better quality and stronger parts.

One improvement in the very recent car design is the completion of the lining of the car to the top plate. By doing this not only is the car strengthened, but it is made more durable, and perishable and moist freight is kept away from the space between the lining and sheathing.

Grain doors are giving no end of trouble; not so much because they are inoperative after use and deteriorate rapidly, as for the reason that they are easily destroyed at terminals by the recklessness of the men who unload cars under contract. What is needed is a grain door that is practically indestructible and can be opened when the car is loaded with grain without the use of an ax and crowbar. Some of the most ingenious and easily opened doors are made of material that will not withstand for one trip the treatment that they now receive.

In looking over the progress of car construction in the past few years, one cannot fail to notice the changes and improvements in the specifications prepared for the builders by the railroad companies and the new methods of inspection. The subject is too broad for consideration here. I can only state to you that a proper specification results directly in a better car for less money. A recent large order for high grade 60,000-pound cars was let for 1 1/2 per cent. less price per car as a result of a complete revision and a decided improvement in the specification. The revision consisted in reducing the requirements for material in certain unimportant parts; and increasing those for the fundamental details that are deteriorated by use. This subject is one that is worthy of further consideration, and I would suggest that it be made one of the topics to be considered by this club.

"Conversion" of a Locomotive.

The Strong locomotive, A. T. & S. F., No. 638, is now being converted in the Topeka shops into a standard American type eight-wheeler.

Standard Turntable of the Passaic Rolling Mill Co.

The illustrations which accompany this description show in plan, elevation and cross section the standard turntable manufactured by the Passaic Rolling Mill Co., Paterson, N. J.

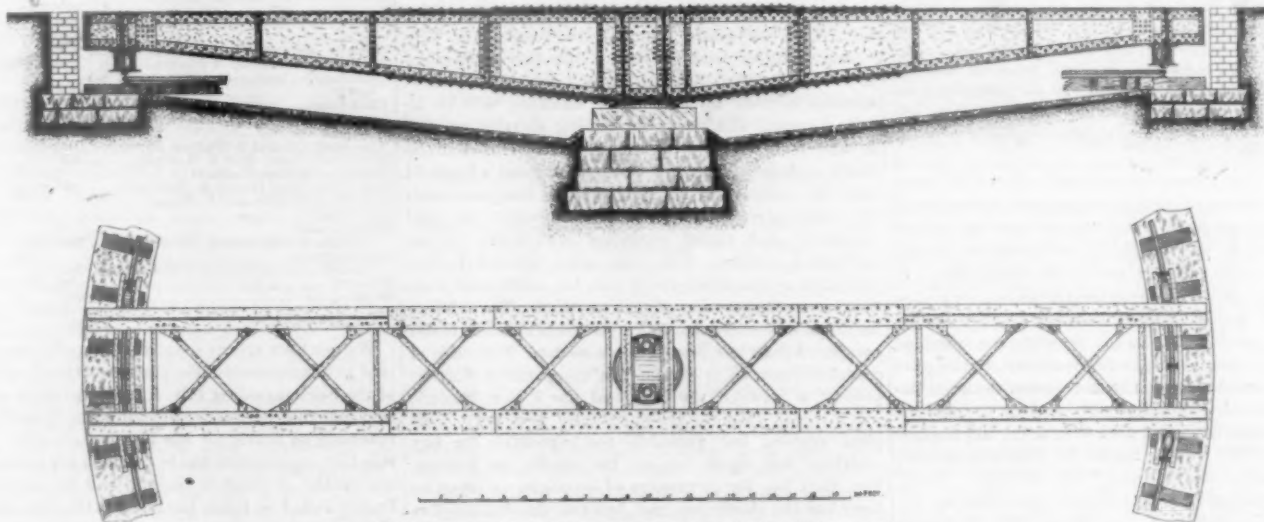
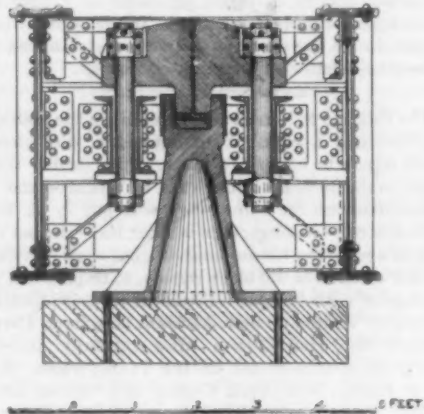
These turntables are entirely centre bearing, and rest on hardened steel discs, which offer small resistance to turning around, and are, at the same time, of sufficiently large diameter to give ample bearing surface to maintain them in good working order, and prevent abrasion by excessive pressure. The discs are 6 in. in diameter for the smaller tables and 7 in. for the larger sizes.

The tables are suspended from the saddle and centre-pin by two bolts made of re-rolled iron. Two bolts are used in preference to four to avoid the uneven distribution of the load produced by tightening the bolts which is liable to occur when more than two are used. A wrought iron band is shrunk around the top of the pivot casting and is effective in resisting the strains produced, by the tipping of the table, against the sides of the casting in case of the binding of the steel discs, when not properly oiled or from some other cause. The vertical adjustment of the tables is easily made with the suspending bolts, and without the use of packing plates or other devices.

The flanges are made of 6-in. angle irons extending the full length of the table, without splices, and reinforced at the centre with cover plates. In proportioning the flanges due regard is paid to the effect of the varying sign of the strains at any point of either flange, due to the position of the locomotive, and the stresses are kept low to avoid excessive deflection at the ends of the table when loaded. The formula used for determining the sectional area of the flange is: (Maximum stress of greater kind $\div \frac{1}{2}$ maximum stress of lesser kind) \div

slate in short sections, and after the wires were laid they were filled at intervals with sand, to guard against the spread of fire. All the cables and wires in the building are covered with fireproof braid outside the kerite covering. Every joint in the office is soldered and insulated with the same care given to submarine work.

It will be remembered that the fire which destroyed this building started in the switchboard, the most vulnerable point in the building. To guard against a recurrence of such a disaster there are five main-line switchboards, separated as widely as possible. This affords the incidental advantage of locating each switch near where its wires are operated. There is an office wire by which chief operators can communicate with each other.



STANDARD TURNTABLE—PASSAIC ROLLING MILLS CO.

10,000 = net area in square inches required. The girders are connected to each other by rigid angle iron bracing, effectively secured to the flanges, and with six transverse frames also of angle iron.

These turntables are made in five sizes, for pits 40, 45, 50, 55 and 60 ft. in diameter, and can be made of still larger sizes if required. The 55 and 60-ft. turntables are built from three patterns for turning 75, 90 and 103-ton locomotives respectively. Where shipment can be made by rail the tables are loaded on cars, complete, ready to set in the pit. Where pits are already built, or old tables of other makes are to be replaced, these tables can easily be made to fit. One hundred and ten of these turntables are in use on 42 different railroads.

New Office of the Western Union Telegraph Company, New York City.

Mr. A. S. Brown, Electrical Engineer of the Western Union, has an article in the *Electrical Engineer* describing the new equipment of the company's main office at Broadway and Dey street, New York City, which was burned out in July, 1890. The five upper stories of the building have been entirely rebuilt, and the operating department, which occupies the whole of the eighth floor and part of the seventh, is now claimed to be the most complete telegraph office in the world, and the largest with one exception, that in London, recently described in these columns. The wires, 2,150 in number, enter the building from underground conduits in cables of 100 conductors each, laid in iron ducts and terminating in a fireproof vault. This vault is of slate, supported in an iron frame, and can take 3,300 wires. From here the wires run in 3-in. wrought iron pipes through two widely separated fireproof shafts to the operating rooms. Here they are carried to the tables by channels in the floor, which are laid in both directions (at right angles) and pass under the centre of each table. The channels were made by laying down wooden molds on the fireproof floor and filling in around them with concrete to form the final floor. The channels are covered with slabs of

The switches are of the usual double jack pattern, with a total of 1,025 straps and 30 horizontal rows of discs. All the switchboards are surmounted by banks of incandescent lamps, to be used as resistances. About 2,100 of these lamps are used. All dynamo leads and ground connections can be quickly cut off in case of fire, and the main lines have "W. B. G." protectors, a short piece of fusible wire, which is relied upon to melt in case of an abnormally strong current. Besides the five main-line switches there are several others, including a loop switch, which accommodates 450 loops, extending to brokers' and other branch offices. Most of these loops connect with duplex or quadruplex lines, and the resistance lamps, which range from 20 to 80 ohms, are to adjust the resistances of the loops for these instruments. A number of special dynamos, used as intermediate batteries, are brought to this board and can be connected by "flying loops," of which there are 125, with any desired line. The functions of this switch are similar to that of the central office in a telephone exchange system.

A number of leased wires are connected with an annunciator switch, fitted with drops in the usual way. The lessee, by grounding, can at any time release the drop connected with his wire, and thus promptly call the attention of the chief operator in the general office. The time repeater for sending out standard time at noon has 92 repeating magnets, the points of which are connected by as many loops to the five main-line switchboards. This apparatus can also be used as a repeater for sending messages, so that on such an occasion as an election night a single operator may send on 92 wires at a time.

All the foregoing is on the eighth floor. The seventh floor contains the Wheatstone instruments, the Milliken-Hicks automatic repeaters, the quadruplex apparatus for lines operated by branch offices direct, the gold and stock instruments, the Commercial News Department, etc. There are four lines operated by Wheatstone instruments and these require 30 perforating machines and 30 typewriters. Two Wheatstone lines are worked with Chicago, one with St. Louis and one with New

Orleans. On the Chicago circuit, with one repeater at Buffalo, 175 words a minute can be sent. There are 30 quadruplex sets in this room and five transmitting machines for the stock quotations, etc., distributed through the city.

There is not a cell of battery in the building. The first dynamos used as substitutes for chemical batteries on telegraph lines were placed in the New York office in 1880, and the innovation was very successful; but there were, nevertheless, 10,000 cells in the building at the time of the fire in 1890, these being used mostly for local and short circuits. There are now three gangs of dynamos for main lines, each gang consisting of five Edison 40-ampere machines, connected in series. The currents carried out vary from 70 to 330 volts, the higher potentials being used for duplex and quadruplex circuits. There are six machines of lower voltage for short lines and locals. Each gang of dynamos is driven by a separate vertical engine of 15 H. P., and they are run at 1,250 revolutions. There are also 30 small dynamos, for intermediate main line batteries, delivering currents of from 50 to 125 volts. The resistance lamps are arranged to show a dull red glow whenever a current is accidentally short circuited, thus affording a convenient notice to the chief operator in case there is trouble on the wire.

Messages are carried from one point to another in the office by the Martin cash-carrier system, which consists essentially of a double track miniature cable railroad. There are several lines of these carriers, all terminating in a large gallery in the eighth story, and there are 57 stations. There is a 5-H. P. Crocker-Wheeler motor to run this system and another similar motor in reserve. The gallery referred to also contains the terminal valves of the pneumatic tubes, of which 24 run to various points in the building, four to the Twenty-third street office, 2½ miles away, and four to branch offices near by.

Thus all messages sent to or from the building come to this gallery.

The pneumatic tubes to Twenty-third street, which have been in use several years, are 3 in. diameter inside, and there are three way-stations. The tubes are of brass, weighing 3 lbs. to the foot. They are laid in pairs, in creosoted boxes, under the middle of the street. The tubes to the other offices are 2½ in. diameter; and six single lines, running to newspaper offices, are 1½ in. diameter. The total length of tubes is 13 miles. With a vacuum of 22 in. the carriers to Twenty-third street travel about 24 miles an hour. All lines except those in the newspaper offices are double, and carriers follow each other as fast as may be desired, neither a space interval nor a time interval system being found necessary. The air pumps are operated by horizontal duplex engines of 36 in. stroke, the steam cylinders being 20 in. and the air cylinders 32 in. diameter. The engines have a capacity of about 300 H. P., but use only about one-tenth of that at present. Water-proof carriers are provided to guard against damage to papers by moisture.

The building is lighted throughout by electricity, by three Edison No. 16 machines driven by three 75 H. P. Straight-Line engines. Steam is supplied from the street main, but there are six boilers always kept ready to fire up at a moment's notice. The number of lines operated from the building is 750, of which four are Wheatstone, 42 duplex, 62 quadruplex, two printer and the rest Morse. The office has accommodations for 800 operators, and the daily average number of messages handled is 100,000, exclusive of press reports.

Chew, Chew, to Go Ahead.

And chew, chew, to-back-her, is doubtless the rule on the Manhattan, as on other roads, for locomotive runners who wish to make their engines move energetically; but the conductors and guards on the Manhattan must get along without the comforting sanction of that euphonious rule—in other words, they have been notified that they must not chew tobacco. Passengers have complained so much of soiled clothing and annoyances of various sorts that the management concludes that it is best to adopt a higher standard of neatness.



ESTABLISHED IN APRIL, 1856.

Published Every Friday.

At 73 Broadway, New York.

The subscription price is \$4.20 a year in North America, and \$6.08 in foreign countries.

EDITORIAL ANNOUNCEMENTS.

Contributions.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

Some of the large railroad companies are watching carefully the attempts to introduce new air brakes and are trying to prevent the use of inefficient brakes on freight trains. So far, orders have been issued to conductors to cut out uncertain and unknown air brakes only; but a further decision has been reached that if such brakes are found to be cut in with the standard brakes of the road, owing to the inability on the part of inspectors and trainmen to distinguish between the good and the bad, something will be done to prevent as far as possible receiving cars with uncertain brakes. At present cards will be issued to be tacked on each side of the cars with the words "odd air brake" there on. An important step has already been taken by the Executive Committee of the Master Car Builders' Association in the allotment of the subject of standard air brake tests to the Committee on Metal for Brake Shoes, Messrs. Rhodes, Wall and Gibbs. The primary purpose of this Committee is, as we understand, to compare the New York with the Westinghouse, taking the latter as a standard. This Committee has already had one meeting. The interest shown by several general managers to whose attention this matter has been brought is sufficient to encourage the adoption of a clause in the rules of interchange that will prevent the use by private car companies and others of an air brake that is not in every way what has been determined by experiment to be a safe and operative device for freight trains.

The Chicago, Burlington & Quincy is conducting a series of trials of the Westinghouse and the New York air brakes this week at Burlington. The plan was to commence on Wednesday morning with a test of the New York air brake with the new triple valve. On Thursday a test was to be made of the Westinghouse with the light graduating spring, and on Friday a test of the same brake with a heavy graduating spring. It may not be generally known what is meant by the graduating spring; it is the spring under the piston of the triple valve which keeps this piston traveling within the limits of the graduation or service stops under ordinary conditions. When there is a large reduction of pressure in the train pipe, the triple valve piston moves forward and compresses this spring and brings into action the emergency feature which applies the brakes with greater force and rapidity than for service stops. The use of the heavy spring has been a necessity in order to give a greater latitude in which the engineer may work his brake handle without bringing the emergency feature into action, during the period when the old three-way cock is being removed from the locomotives and the new automatic engineer's valve used in its

place. The light graduating spring is the proper one to use as soon as freight trains are nearly all equipped with air brakes and the automatic engineer's valve is generally applied to the engine. These trials at Burlington are the most important that have taken place since the Westinghouse train went around the country in 1887. Measurements will be made of the action of the two types of brakes under regular service conditions on a fifty car train. There will be a dynamometer car and a slideometer in the rear car, as at the Burlington, 1887, tests. The purpose of these tests is to determine two things—one the comparative rapidity of action of the New York air brake and the other the amount of shock produced in a fifty car train with vertical plane couplers in the ordinary condition, in the last car on a fifty car train, during an emergency stop with each type of brakes.

The Chicago & Northwestern has given the Hall signal Company a contract for automatic wire circuit block signals to equip 87½ miles of its double track lines (on the divisions terminating in Chicago), and in connection with the same work will put in 32 Hall bells at street crossings, thus making the contract the largest ever given for automatic signal work. It calls for the erection of 200 block signals, to be placed at an average of 4,000 ft. apart. President Hughitt, General Manager Whitman, and Assistant Engineer Carter adopted the Hall system after carefully investigating the systems in use on the Pennsylvania, Boston & Albany, New York Central and various other roads. The block signals will be put on the different divisions as follows: Galena Division, from Fortieth street (Chicago), to Turner Junction; Milwaukee Division, from Claybourn Junction to Waukegan; Wisconsin Division, from Claybourn Junction to Barrington. The decision to use the wire circuit, with short sections so that no permissive blocking will be allowed, makes this a very interesting installation and it will be watched with much interest. Automatic block signaling has now obtained so good a foothold that the question of its efficiency as compared with the man-operated system is an important one, and managers and signal engineers who desire to see perfection attained will look with interest to the operation of this extensive plant for additional data bearing on the solution of that question. The relative merits of different automatic systems can also be better compared than has been possible so far. For roads of comparatively light traffic the competition, for the present, is between the Hall and the Union Electric (clock work). The electro-pneumatic is a very complete system, but probably too expensive for any positions but those where the traffic is intense. The Hall has the advantage of simplicity in using no force but the electro-magnet, but the disadvantage of a glass covering over the signal, if that is a disadvantage. The use of a wire circuit system presupposes absolute blocking only, but absolute blocking is the only right kind under any system. It must also be assumed that trains will not break in two, but that is not an insurmountable difficulty, for these signals have been used for years on the New York, New Haven & Hartford; and it would, moreover, be easy to have the rear car instead of the engine clear the signal for a block section that has been vacated. Western railroad men who have been unwilling to judge of signals operated under Eastern methods will now have a chance to see the working of the wire circuit system under their own conditions, and on one of their best roads.

Three Thousand Miles of Block Signals.

The present marked activity in the matter of block signaling gives ground for confidence that the rate of progress in this means of safety is to show a decided increase, and in view of this probable expansion, it may be worth while to look backward for a moment. Over three thousand miles of American railroad is now operated under block signal rules, a larger total than is appreciated by most men, even those interested, unless they stop to count it up. As the comparing of our lack with England's abundance in this matter has come to be in a sense a habit, it will be well to revise our notes, and, although American signaling is still in its infancy, to definitely recognize the progress that has been made. It should be remembered that we are not to compare our two per cent. out of thousands of miles of "thin" road with Great Britain's 95 per cent. (based on 100 per cent. of very busy roads); the fairer comparison would be to take the roads according to their density of traffic.

To set forth present conditions in a clearer light we have put the mileage of the principal roads running trains under a space interval system in tabular form,

and print the table hereunder. The 3,000-mile estimate just given is made up of the mileage indicated by a star (*). The total of these starred figures is over 3,500 miles, but we have stated the sum conservatively because a number of the items were partly estimated, notably the Pennsylvania system east of Pittsburgh, which has 580 miles that we know of, but on which there are a number of single track divisions for which the exact figures have not come to hand. Other items represent lines on which there are varying conditions, as stated in the footnotes; but the total of the entire list, nearly 7,000 miles, should not by any means be regarded as a "manufactured" statement, for it represents practice which is a decided improvement on old-fashioned methods.

The list includes only those roads employing the space interval to a greater or less extent on a considerable length of road. But as progress may be looked for among those who have already taken some action, it is proper to name, in this connection, a half dozen or more other roads which have small sections of road blocked. These are: Connecticut River; New York, Ontario & Western; Savannah, Florida & Western; Seaboard & Roanoke; East Tennessee, Virginia & Georgia; Nashville, Chattanooga & St. Louis, and Southern Pacific.

MILEAGE OF RAILROADS OPERATED UNDER BLOCK SIGNAL RULES.

	Not Auto- matic. Miles of road.	Auto- matic. Miles of road.
Baltimore & Ohio.....	320*	
Baltimore & Ohio Southwestern.....	8*	
Boston & Albany.....		110*
Central of New Jersey.....		7*
Chesapeake & Ohio.....	37*	
Chicago & Alton.....	848*	
Chicago & Milwaukee.....	58*	
Chicago, Milwaukee & St. Paul.....	606*	
Cincinnati, Hamilton & Dayton.....	288*	
Cleveland, Cincinnati, Chicago & St. Louis.....	25*	
Fitchburg.....	15*	
Lake Shore & Michigan Southern.....	15*	
Michigan Central.....	1581*	16*
New York Central & Hudson River.....	15*	14*
New York, Lake Erie & Western.....	453*	
New York & New England.....	15*	
New York, New Haven & Hartford.....	60*	56*
New York, Providence & Boston.....		21*
Old Colony.....		138*
Pennsylvania.....		
Entire system east of Pittsburgh.....	700*	0*
Pennsylvania.....		
Entire system west of Pittsburgh.....	300*	
Wabash.....	76*	
West Shore.....	423*	
Total miles.....	6,563	297

We need not repeat what we have often said before, that in consequence of the absence of interlocking much of the block signaling falls a good deal short of perfection, nor that permissive blocking, for freight trains, is practiced on nearly all the lines represented. In fact this last explanation has to be made for a considerable percentage of English roads. And the most that the British Board of Trade has done in the way of compulsion has been to order companies to erect and maintain the apparatus or appliances deemed by the Board necessary for the operation of the block system; no action is taken to prevent permissive blocking, though the inspectors always frown upon it severely when they come across it in an accident investigation.

What we wish to emphasize is the central fact that the safety of passenger trains is being secured, on a mileage that is now large enough to be appreciable, better than can possibly be done by the time interval system. From 1,000 to 1,500 miles of the manual and 200 miles of the automatic signals have been put in use within the past three years. The Erie now has over 300 miles additional in preparation and the Central of New Jersey has just given a contract for about 25 miles of electro-pneumatic signaling for its four track line. The extension of the pneumatic eastward from Pittsburgh on the Pennsylvania and the active preparations being made by the New York Central to block the whole of its main line, 439 miles, are too well known to need repetition. The Hall Signal Co.'s contract with the Chicago & Northwestern, just announced, is more fully spoken of elsewhere.

New York to Chicago in 18 Hours.

A mail train to run from New York to Chicago in about 18 hours, over the New York Central & Hudson River and the Lake Shore & Michigan Southern, has been discussed in the newspapers during the past week.

¹ Operated under the following rule: "A train that is passed at an open telegraph station by a passenger train going in the same direction, will not leave that station until notified by the operator that the passenger train has passed the next telegraph station; if the wire is not working will wait 20 minutes. A train will not leave a closed or non-telegraph station to follow a passenger train until 20 minutes after departure of the passenger train."

² All trains blocked a station apart in foggy weather and snowstorms.

³ Before and behind passenger trains, freight trains run on 10 minute time interval.

⁴ In foggy weather passenger trains are kept a station apart by the train dispatchers.

⁵ We are not sure that this does not include some detached station signals.

though nothing seems to have been decided upon, and the post office authorities at Washington on one side and the officers of the New York Central on the other seem to be each inclined to throw upon the other the responsibility of having first suggested the idea. Such a train is doubtless practicable and the only question, as Vice-President Webb says, is whether the government is willing to pay the necessary cost. The speed would be practically the same as that made by the Empire State Express, and that train has made a very creditable record thus far. A summary of the train sheets for the 58 days from Oct. 26 to Dec. 31 shows that it arrived in Buffalo on time on 40 days and not over five minutes late on seven other days. There were five days on which delays of over half an hour occurred, slight mishaps to freight trains having occasioned these in each case. On Dec. 25, 28 minutes lost time was made up between Albany and Buffalo, and considerable losses have been made up on other days. The schedule of this train is 8 h. 40 m. for 439½ miles, equal to 50.75 miles an hour, including the four stops. The distance through to Chicago is 965 miles (calling the Lake Shore via the Sandusky and Air Line divisions 325½) and the Empire State's route would make the schedule through 19 hours, equal to 18 hours apparent time, and 30 minutes longer than the time mentioned by the newspapers.

As regards track and grades the Lake Shore is doubtless as good as the New York Central for fast trains, and in freedom from curves even better; but it has not three extra tracks on which to run the other trains, and some of the way it has not even one; that is, it is a single track road. But there are two separate roads most of the way where there is not a double track so that the conditions can be made quite favorable every where. It is, of course, incumbent upon a manager to make them as favorable as possible in such a case, even for a mail train, for to kill six mail clerks, as at Kipton last April; is as bad either ethically or in a business sense, as to slaughter the same number of passengers. The use of the absolute block system, on both double and single track, at least for this train, and the equipment of all facing points on double track and of all switches on single track with distant signals should, therefore, be regarded as imperative prerequisites to making this further attempt to beat the world.

But after safety comes the question of cost; and though the Government may conclude to pay a very liberal price, the question with the road is whether the real cost can be determined at all. To make very high speed with regularity, other trains, especially freight trains, must be run so as to clear the fast train by a large margin—more than 10 minutes, in many cases—and the losses, direct and indirect, by the delays caused in this way are not easy to calculate. A train of this kind would be of value to people sending letters through between New York and the Missouri River and places west of there, but it is still a somewhat questionable improvement for business between New York and Chicago proper, as letters must be mailed in New York about three o'clock and cannot be delivered in Chicago until about 11 or 12 the next morning. To really cover the 965 miles "between two business days" would require a decided advance on the "Empire State" schedule.

Railroad Growth and Parliamentary Costs in England.

The applications to Parliament for authority to build new railroad lines in Great Britain are less now than at previous sessions of Parliament, which may to some extent be due to the fact that the companies have just had their authority to make charges limited, and that they do not yet know just what effect the change will have on their earnings. It is not a simple matter to get authority to build a railroad in Great Britain, and it is generally very costly. The application for a bill must be accompanied by detailed plans and estimates, and the opposing interests must be faced before the Parliamentary committee, before which something like a trial of the merits of the proposition is held and a substantial sum must be deposited as evidence that the promoters seriously intend to carry out their project. And it is by no means certain that authority will be granted.

An article in *Engineering* of Jan. 15 shows that in the 35 years from 1856 to 1890 the bills deposited sought authority for 42,983 miles of railroad, while only 11,793 miles were actually built in that period, so that most of the bills were either withdrawn or rejected. In the last 20 years of that period, the bills presented proposed 17,544 miles of new railroad and the expenditure of \$3,865,000,000—some three times as much as was actually expended in that time.

For 30 years most of the additions to the English railroads have been made, naturally, by the old companies. If a new line is needed, the managers of existing lines know it better than any one else, and in almost all cases it will be worth more as part of an existing system than if it stands alone. A report to the House of Commons in 1883 showed that the companies then existing had expended simply for promoting bills in Parliament the sum of £3,925,000 = \$19,100,000, which was an average of \$14,550 for each bill introduced. *Engineering* estimates that the aggregate parliamentary expenditure from 1855 to 1890 was not much if any less than £25,000,000, or \$121,500,000! This is at the rate of \$10,300 per mile of railroad actually constructed in that time, and to \$2,420 per mile for the lines for which bills were asked, nearly three-fourths of which were not built. With these certain expenses before permission can be obtained to build a railroad, the people who get up a project in the hope of finding some one else to pay for it are likely to be cautious.

The railroad system of Great Britain has for many years increased very slowly; from 15,537 miles in 1870 to 17,933 in 1880, and 20,073 in 1890. In the last three years 503 miles were opened. Little is built because little is needed. The country is already well supplied with means of transportation. There is room for more in Ireland, but as those already built there do not pay for the most part, there is naturally no desire to build more. The situation in England is somewhat similar to that in New England and the Middle States, so far as railroad building is concerned; but Great Britain reached this position long ago, and our states only recently. The territory included in "Group II," Middle States, by the Census Bureau, shows of late years a rate of increase in mileage rather less than that of Great Britain. The Middle States have nearly the same area as Great Britain, and about one-tenth less railroad, and one-third the population.

Passenger Statistics—Prussian State Railroads.

Most elaborate statistics have been compiled of the passenger traffic and earnings of the Prussian State Railroads for the three months December, 1890, March and July, 1890, probably as material to be used in studying propositions for a reform of passenger fares, which the great reductions in Hungary and Austria have made a burning question in Germany. These statistics cover 27 of the octavo pages of the *Archiv für Eisenbahnwesen*. They give the number of tickets collected and the earnings from them for each of the four Prussian passenger classes, for each of 25 different distances, 1 to 5 kilometres, 6 to 10, and so on up to 30; then with 10 kilometre intervals up to 60, and then with greater intervals. These statistics are given separately for single (one way) tickets, for round trip tickets, for circular (tourist) tickets, for these tickets taken altogether, for season tickets, for school attendants, for workmen's, for party excursions, etc., tickets, besides tables showing the proportions of the several classes, distances, etc. There is no text, except the few lines necessary to tell what the statistics are.

Among the many facts shown by these tables is this: Nearly 30 per cent of all tickets were round trip tickets, but as fourth class round trip tickets are not sold (except in very few cases) and the fourth class journeys were 41 per cent. of the whole number, this does not properly represent the extent of the round trip sales. Of the first class travel 54 per cent. and of the second and third classes 50 per cent. of the journeys were made on round trip tickets. The 54 per cent of the first-class made on these tickets yielded only 28 per cent. of the first class earnings, while the first class single tickets, though only 31 per cent. of the total of the first class tickets, yielded 60 per cent. of the first class earnings. This is not only because of lower price of round trip tickets (25 per cent. we believe) but largely because a much larger proportion of them than of single tickets are for short distances. Thus 85 per cent of the round trip tickets, but only 51 per cent. of the single tickets were for distances not more than 31 miles.

About 58 per cent. of the first-class journeys (of all kinds), 78 per cent. of the second-class, 90 of the third and 85 of the fourth were for distances of 50 kilometres (31 miles) or less, and 86.7 per cent. of all the journeys. Of the whole number 94.3 per cent. were journeys of not more than 62 miles, and only 1.1 per cent. of them were as much as 186 miles. The total number of tickets for distances of more than 930 miles during these three months (the system including 15,500 miles of railroad) was 2,387, out of a total of nearly 60 millions, and more than nine-tenths of these were tourists' excursion tickets. Season tickets are not issued for distances greater than 124 miles. The statistics credit them with two trips daily each, which indicates that there were less than 20,000 season ticket holders. The earnings from these tickets was about \$35,000 for the three months. Only about 6 per cent. of the season tickets were for journeys more than 12½ miles long, and 70 per cent. of them were for third-class pas-

age. The workmen's tickets are fourth-class, the greater part of them are really season tickets for one week. The number of trips on the workmen's tickets was 5,570,000 in the three months, which gives a trip each way every week day for 34,800 people, which is hardly more than might be expected to use the Berlin Elevated Railroad. Still the journeys made on workmen's tickets were 9.3 per cent. of the whole number. They produced but 0.8 per cent. of the earnings, the average cost of each journey being only 2½ cents. The very large proportion of round-trip tickets materially reduces the average rates from those for single journeys, which are usually accepted as representing ordinary fares.

The Manhattan Elevated Road (New York City) has lately extended its third or middle track on the northern portion of the Sixth Avenue line, so that a length of 4.65 miles is now used for express trains during the morning and evening hours, and trains are being run through from Rector street to 155th street, 10½ miles, in 35 minutes. A trial run was made in 32½ minutes. Portions of this middle track have been in use for some time, to permit the express trains to pass local trains without stopping, and the improvement consists essentially in extending the track so that expresses can be run with fewer delays to the local trains. Most of the express trains run on the Ninth Avenue line between Rector and Fifty-ninth streets, that being less busy than the Sixth Avenue line. There are now 11 express trains southward in the morning and 7 northward in the afternoon. Still further extension of the track is in progress and the schedules will probably be further shortened. Railroad men who would like to see a time table which taxes the printing office should examine the working time table of the Sixth Avenue line of the Elevated, which now shows 490 trains each way daily, except Sundays. Of these, about 320 in each direction run through to or from the northern terminus, the others stopping at Fifty-eighth street, which is at the southern end of Central Park. As most of our readers know, the trains on this road have to be run "under control," that is, each engineman is responsible for keeping clear of the train ahead of him without regard to any signal or time interval, so that the time tables, although a necessity for the convenient running of the road, are not depended upon for safety, as is the ordinary time table. The schedules have letters and other characters which facilitate changing engines from one train to another and the arrangement of trains during the middle of the day when part of them are taken off. The regular table is supplemented by a table showing the intervals between trains, which vary from 1.05 minutes to 8.30 minutes, during the busy part of the day. Between midnight and 5 a. m. the interval is 15 minutes. There are several special schedules; one for a baggage car, which runs in connection with the New York & Northern road, one for an ash train, one for a collector's train, all of which run daily; and for a pay car which runs weekly. The latter is scheduled at the various shops and terminal stations, so that the workmen need waste no time in waiting for it. The three other lines, those on Second, Third and Ninth Avenues, have each a time-table book similar to that of the Sixth Avenue line. On Third Avenue there are 504 trains each way daily, on Ninth, 235, and on Second Avenue, 272.

Several statements have appeared regarding the Intramural railroad in the World's Fair grounds, which would lead readers to believe that this matter is decided; but the fact is that negotiations are yet in progress with different constructors who have made propositions. There are several plans to which the officers of the World's Fair have been attracted. One is the proposition to build an elevated structure with wooden columns and steel beam girders, on which it is proposed to run the largest size of double truck street cars, seating about 40 persons, and propelled by electric motors under each car, all connected together and controlled from the front of the train. This is the plan which has in it the least element of experiment. The cost is not great, as the steel beams that will be used can be readily utilized for building construction after the close of the fair. The cars and motors can be procured on a rental basis, and the outlay will be small for the whole plant. Another plan is to use motor cars at the head of a train of street cars, running on an elevated structure; but this plan requires such a heavy motor as to increase too much the cost of the structure. It is generally understood that steam locomotives for this purpose have been abandoned, owing to the great weight and cost. At present the movable sidewalk, which has been in experimental operation for several months on the World's Fair grounds, is exciting considerable interest among the World's Fair people. Before the erection of this sidewalk there was considerable doubt as to its feasibility; but now that it has been operating daily for such a long period and with no failures, there is a growing belief that it could be made to answer the purpose. Of course, its advantages are great, as there is practically no limit to the number of passengers that can be carried, and there is no need of special stations. The cost of operation when based on the present experiment would be less than with the other forms of road, and the structure would weigh less per running foot than when made on any of the other plans. The final propositions for these

various plans have not been made, but they are to be completed by the first of March, when a decision will be reached.

Some decided steps will probably be taken in Chicago before another year to reduce the number of accidents where street railroads cross steam railroads. Scarcely a week goes by but some one is killed and several injured by a collision between the two kinds of trains. No provision is made in many parts of the city to protect the cable cars except the regulation which requires the conductor of the street cars to go forward ahead of his train and stand on the track while the cars run across. This is precaution, but not a prevention. In several cases of accident the conductor was inside of the car and did not know when the crossing was reached, and in others the freight cars of adjacent tracks and sharp curves prevented his seeing the moving locomotive and train until it was too late.

It has been suggested that these crossings be interlocked with distant signals; but the railroad companies have shown this to be impracticable, as the large number of crossings on any road entering Chicago and the great number of cars running on the street lines would practically prevent a train from entering the city within a reasonable time, as it would have to make a stop at nearly every crossing.

Formerly the trunk lines were opposed to doing anything to relieve the danger, but lately they have been putting in crossing gates with considerable grace. At present, however, they fear that the city authorities will compel them to elevate their tracks within the city limits; hence they are beginning to favor viaducts, which formerly they refused to build or help to build, saying that it was for the benefit of the city alone and that the people should pay the necessary costs and damages.

The advent of the World's Fair and the decided increase in patriotic spirit in the city has led to a demand from the people for an elevated terminal, and the recent court decisions have indicated to the railroads that the city can compel them to build such terminals. Hence the willingness on the part of the roads to share the expense of building viaducts. However, these feelings are not shared by all roads to the same extent. One or two have signified their willingness to subscribe liberally toward an elevated terminal, while others still fight hard against viaducts or even crossing gates.

A new passenger tariff was introduced in Holland last year, with rates per kilometre decreasing with the distance traveled, beginning, for the first 50 kilometres, with 4 Dutch cents per kilometre for the first class, 3 for the second, and 2 for the third. Reduced to our cents per mile these rates are:

	1st Class	2nd Class	3rd Class
1 to 31 miles.....	2.57	1.92	1.29
31 to 62 ".....	2.31	1.73	1.16
62 to 93 ".....	2.05	1.54	1.05
93 to 112 ".....	1.80	1.35	.90
112 to 130 ".....	1.59	1.16	.78
130 to 150 ".....	1.38	.97	.66
Over 150 ".....	1.17	.78	.55

Round trip tickets cost one half more than single tickets. In Dutch currency the basis of the rates is very simple. Beginning with 4, 3 and 2 cents per kilometre for the first 50 kilometres, a reduction of one tenth from this is made for the second 50 kilometres, of two tenths for the third 50, and of three tenths for the next thirty kilometres. Then the reduction increases by two tenths of the single kilometre rate for the next two additions of 30 kilometres, leaving but one tenth of the basis rate for greater distances. There is scarcely any line more than 150 miles long in Holland. Applying these rates to a journey 162 miles long, which is probably as long as can be made in that country, we find that a third class ticket costs 3.72 Dutch florins = \$1.49, a second class ticket \$2.24, and a first class \$2.98, which seems sufficiently cheap, especially as it only costs one half more to go and return. The great bulk of the travel is for short distances, however, and for these the rates are not lower than in some other European countries.

A few years ago a party of American capitalists went to Russia to examine the anthracite coal mines in the Donetz basin, which were said to be of immense extent and value, and likely to justify the establishment of great iron works and make of that district a sort of Russian Pennsylvania. Apparently nothing came of this inspection, but no reason was given why the Americans did not take up the enterprise. We have now statistics of the Donetz coal shipments, which indicate that the mines are not so valuable as they were reported to be, though they are doubtless of great importance to Russia, in many parts of which wood is getting scarce, and where the fuel problem is a serious one to many of the railroads and a serious obstacle to the successful prosecution of many industries. The figures show 645,490 metric tons (2,204 lbs.) to have been shipped in 1880, which is increased to 1,188,300 in 1885 and 1,957,070 in 1890. The maximum was 2,100,740 tons in 1889. The decrease the next year was due to a reduced demand, the railroads having a light traffic and requiring less, the beet sugar works using less, and petroleum taking the place of coal more and more in the East. In 1889 the railroads took 40 per cent. of the total production, the sugar works 14½ per cent., steamboats

5½, and metallurgical works less than 1 per cent., the latter amounting to 185,170 tons, which is not at all what was expected of these mines.

The Cleveland, Cincinnati, Chicago & St. Louis is making an experiment with limited local tickets similar to that of the Chicago & Alton, although on a small scale. Between a few of the principal stations on the road one-way and round-trip tickets are being sold which are good only for continuous passage. The Alton tickets, it will be remembered, are good for one day after the date of sale, but with these on the Big Four the journey must be begun on the day of sale. The returning portion of a round-trip ticket is good for 30 days, but as soon as it is presented for passage the conductor punches out the date, so that it is good only for continuous passage. The form of the ticket is quite different from the Alton's. The time limit is made simply by a printed notice holding the purchaser to the date stamped on the back of the ticket. Each ticket has a detachable check, and this, instead of the ticket proper, bears the General Passenger Agent's signature; this check is detached by the last conductor and given to the passenger as a receipt, but the value or purpose of this receipt is not clearly apparent. It can hardly answer for a hat check, as it is not to be detached until after it reaches the last conductor. The readiness of the company to redeem unused tickets at the selling office within five days is announced on the face of the ticket.

The high speed, compound locomotive for the Reading has been finished at Baldwin's and will be put into service at once. The design of this engine is novel and it is the first of that type to be built in this country for high speeds, so far as we can learn, although it has often been proposed. The general arrangement of the wheels, boiler and frame, was shown in the *Railroad Gazette*, Nov. 13, 1891. It is expected that this will be the most economical high speed engine in this country, as it has compound cylinders, large driving wheels and an unusually large grate and heating surface.

The compound locomotive of the Chicago, Burlington & Quincy Railroad, which has been in service about one year, has proved to be a decided success. The engine has been in a wreck and has been generally overhauled, and is to be put in service again without material modification. Since this engine was put into freight service there has been a saving of 20 per cent. in fuel consumption. The records have been carefully kept and there can be no dispute as to the saving in this case.

NEW PUBLICATIONS.

Institution of Mechanical Engineers (British.) Proceedings of the Liverpool meeting, July, 1891.

This volume contains several papers and discussions of special importance. The longest is a Review of Marine Engineering during the past Decade, by Mr. Alfred Blechynden. Another paper by Mr. William Shapton is on the Methods of Storing and Handling Grain at the Alexandra Docks, Liverpool. Mr. E. Leader Williams has a short paper on Mechanical Appliances Used on the Manchester Ship Canal. The pages devoted to the excursions of the society are not the least valuable part of the publication, describing as they do some of the remarkable works in the neighborhood of Liverpool.

Messrs. John Wiley & Sons announce as in preparation a new work on timber and metallic structures entitled *Theory and Practice in the Designing of Modern Framed Structures*. This book is written jointly by Prof. J. B. Johnson, author of "Theory and Practice of Surveying," and Professor of Civil Engineering in Washington University, St. Louis, by Mr. C. W. Bryan, Designing Engineer of the Edge Moor Bridge Works, Wilmington, Del., and by F. R. Turneure, Instructor in Civil Engineering in Washington University.

The Engineering Magazine; February, 1892.—In this issue Col. W. R. King, Engineer Corps U. S. A., writes in reply to the paper by Mr. Wisner on Worthless Government Engineering, which appeared in the January issue. Mr. T. L. Greene has a short paper on The Decline in Railroad Building, and Dr. Coleman Sellers continues his important papers on American Supremacy in Mechanics.

Journal of the Franklin Institute; February, 1892.—The paper that strikes us as having special value in this issue is one of the 12 pages by Dr. C. B. Dudley on "Bearing Metal Alloys," which is to be continued.

Foreign Railroad Notes.

The famous electrical firm of Siemens & Halske has submitted to the Berlin authorities a plan for an electrical railroad with several branches in the southern part of that city.

There is a larger proportion of first-class passengers on the Spanish railroads than on those of most other European railroads, the chief lines having 8 per cent. or more of their passengers in this class. The third-class passengers are from 71 to 88 per cent. of the whole.

In Austria, out of a total of 9,583 miles of railroad 4,366 miles are worked by the State; in Hungary, of a

total of 7,229 miles, 5,935 are State railroads. Austria is about to acquire the lines of another company which measure 639 miles.

The government regulations in Austria concerning the construction of railroad bridges, issued in 1887, permit the use of wrought iron exclusively, and do not admit Bessemer or Martin steel; but the Minister of Commerce has now directed the Railroad Inspecting Bureau to prepare new regulations for the use of steel.

The Austrian railroads have reported on the state of fruit and forest tree culture on their right of way at the close of 1890. They had then 359,573 fruit trees, averaging 37.8 per mile of road, an increase of 10,580 trees during the year. Eight railroads had besides 63,663 mulberry trees. Of forest trees and shrubs, 3,503,186 had been planted separately, besides 5,325,044 in rows and an area of several thousand acres in separate inclosures.

So many accidents have occurred on the steam tramway from Paris to St. Germain, which enters well into the city, that the Prefect of Police has ordered that the speed of trains on it be limited to 10 miles an hour inside the fortifications, and 12½ miles outside—the latter about elevated railroad speed. At street crossings the speed must be reduced to a walking pace.

The steam tramways which have become such an important part of the transportation system of Italy, and in the extent of which it far surpasses all other countries, at the beginning of 1891 were 124 in number, of which 81 were main lines and 43 branches, and they measured in the aggregate no less than 1,577 miles, an average of 12.7 miles for each line or branch. Of the entire mileage all but 200 miles was laid in public highways. All but three lines have the standard gauge. Generally the greatest speed of trains on these roads is 12½ miles an hour, but on one line a train runs 15½ miles an hour. On a line running into Florence the speed is but 4½ miles an hour. On most lines four is the maximum number of cars in a train, but between Rome and Tivoli a train sometimes has 11 cars. In several cases one company owns several tramways. One of the tramways (Mantua to Brescia) is 43½ miles long, and another, in the southeast part of the Peninsula (Bari to Barletta), 40 miles long. These lines usually begin at the outskirts of large towns.

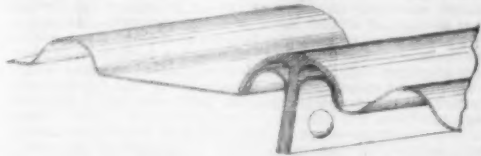
The Russian railroads do not excel in speed. Of 286 through time-tables, with routes the longest of which are as much as 1,500 miles, only 6 show speeds above 26 miles, with a maximum of 28 miles, 5 between 23 and 26 miles, 56 between 20 and 23, 99 between 16½ and 20, 107 between 13 and 16½, and 23 less than 13 miles—speeds which remind us of our Southern railroads shortly after the war. Considering the population of Russia the passenger traffic is very small, the number of passenger journeys in 1888 having been 43,000,000, with the unusually long average journey of 66 miles. The population being 90,000,000 this gives an average of 24½ miles of travel for each inhabitant, against an average of 190 miles in this country. There were but about 18,000 miles of railroad, however, in Russia to our 150,000, and the passenger traffic is denser, on the average, on the Russian railroads than on ours, being equivalent to the movement of 168 passengers each way daily there and of 104 here.

Until last year grain was always carried in sacks on the Russian railroads, though in favorable seasons enormous quantities were shipped to Baltic and Black Sea ports for export, under the circumstances most favorable for grading and carrying in bulk. Last spring the Minister for Railroad Affairs issued elaborate regulations for carrying grain in bulk. Two methods were permitted, one like ours, with grain doors, and the other a patented process, by which the inside of the car was occupied by a single great sack, which held the grain in a method which was once suggested here for carrying grain in open coal cars. If the shipper uses the grain doors supplied by the railroad he pays a rouble (about 50 cents) for one car carrying 22,000 lbs., and the railroad guarantees the delivery of the whole weight received, less 1 per cent. allowed for drying *en route*; but if he uses his own grain doors the railroad is not responsible for the quantity delivered, unless it is proved that the shortage was due to its fault. Very soon after the issue of these regulations one third of the receipts at Riga came in bulk, and it was believed that very soon substantially the whole Russian exports would be transported in that way, to the great saving of sacks, 93,000,000 of which are said to have been used in the Russian grain trade.

Lamont & Bronner's Car Roof.

An interesting design of metal car roof is shown by the accompanying cut. It was devised and patented by Mr. E. D. Bronner, Master Car Builder of the Michigan Central Railroad, and Mr. R. P. Lamont, who has devoted considerable attention to metal car construction. This roof, as shown, is made of corrugated metal which gives the necessary stiffness between the carlines, which are made of rolled semi-circular tee section. There are two styles of corrugated roof used in this construction; one shown on the left and the other on the right of the cut. One has corrugations comparative-

ly close together, and in the other they are separated by a flat space. For an all metal roof, this is one of the best that has been proposed. It has the advantage of being strictly water tight, and is easily repaired, and it is cheap and strong. Metal roofs have been objected to by many on account of the danger of trainmen slipping when passing to and fro; but to prevent this it is only

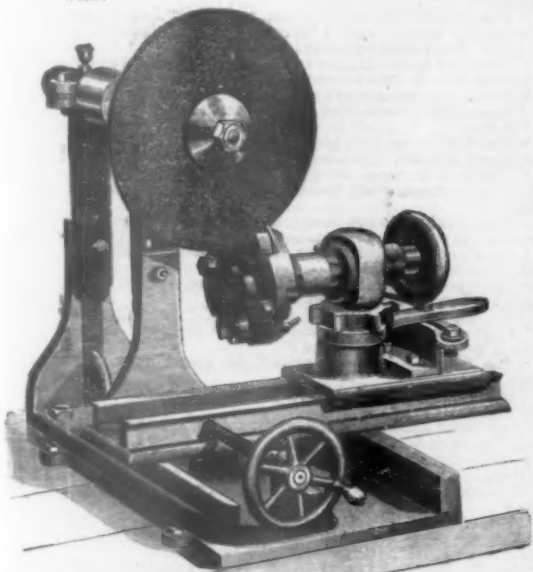


necessary to put a longitudinal strip of wood along the roof of the car and secure it to the carlines.

Shimer Head Grinder.

With this we show an illustration of a machine made especially for grinding the bits of shimer heads or other similar work on wood-working machinery.

As will be seen, the machine consists of a head supporting the emery wheel arbor at the top in such a manner as to be adjustable, and below this a head on which is supported an arbor to which the shimer head is secured. This arbor can be raised or lowered for adjustment by means of a thread cut on the shank, and can be turned to any desired angle and clamped. When adjusted properly it is only necessary to bring the bits one after another into position by revolving the arbor. They are ground by moving the carriage by the hand wheel shown. This insures uniform work, and, of course, the work is very quickly done, all the difficulties met with in grinding such bits by hand being done away with.



The machine weighs 420 lbs., or, without the table, 200 lbs. Its height from the table to the centre of the spindle is 17 in., and from the floor 35 in. The emery wheel used is 10 in. x 5/8 in. There is a countershaft with pulleys for a 3 in. belt, and it should run at a speed of 370 revolutions, giving the wheel a speed of 1,000 revolutions. It is made by the Springfield Emery Wheel Manufacturing Co., Bridgeport, Conn.

TECHNICAL.

Manufacturing and Business.

The Walker Manufacturing Company of Cleveland, O., has just completed a 75-ton rope wheel 32 ft. in diameter for the Third Avenue cable road, New York City. Four of these are to be built. The face of the pulley is 73 in. wide, and there are 32 grooves for carrying 2 1/2 in. cotton ropes. This is one of the largest rope wheels built in this country, and is a magnificent example of detail of rope driving machinery.

The business of the firm of Reginald Canning & Co., of New York, is now being carried on by Reginald Canning without change of name, Mr. John S. Dodge having retired from the firm on Jan. 1, when the copartnership was dissolved.

The Albion Iron Works, at Victoria, B. C., have an option on land at Shoal Point, near the outer wharf, upon which it is intended to build large iron works. Provision has been made for a dry dock, and an extensive iron ship building plant may be part of the enterprise.

The St. John Bolt & Nut Works will be in running order again by March.

The National Railway Exposition is an incorporated institution for the purpose of maintaining a permanent exhibit of railroad mechanical and electrical appliances in Chicago, at 22 and 24 Custom House Place. The location is in the vicinity of the Grand Pacific Hotel, the

Rookery, Monadnock and other railroad buildings in Chicago. The space will be rented at \$6 per square foot a year, and all conveniences, such as telephones, messenger service, stenographers, technical publications, etc., will be given to the exhibitors free of charge.

The W. C. White Lumber Co., of Cumberland, Md., have closed a contract with the South Baltimore Car Works for the delivery of a million feet of dried sawed white oak lumber for car building purposes. The purchase amounted to over \$23,000, and the timber will be cut along the West Virginia Central Railroad and shipped from Gorman and Seull stations, W. Va.

The New York Construction Co., with a capital stock of \$150,000, has been incorporated at Indian Springs, Fla., by John O. Bronson, Albert Matthews and W. W. Walker, for the purpose of constructing bridges, railroads, etc.

The Lehigh Spring Co., of Lehigh, Pa., will, it is reported, construct a branch factory at Cumberland, Md., for the manufacture of railroad and spiral springs.

The Texas & Louisiana Equipment Co. has been incorporated in Illinois, and also the Illinois & Texas Construction Co., with a capital stock of \$50,000, to build railroads and bridges. The incorporators are Monroe L. Willard, Lockwood Honore and Eugene A. Dupee.

Negotiations are now pending among the proprietors of the Benwood Iron Works, the Wheeling Iron & Nail Co. and the Belmont Iron Works, all located in Wheeling, looking to a combination of the three concerns under one management. A joint meeting of the directors of the three companies was held last week and plans were presented for the consolidation. The joint capital is to be nearly \$2,000,000.

New Shops.

The Halifax Street Railroad Co. proposes to equip its repair shops at Halifax, N. S., with machinery to build street cars. It will soon begin the construction of six open cars.

It is said that plans will soon be ready for the extension of the Pennsylvania Railroad station in Philadelphia from Broad and Filbert to Market street.

Signaling.

The office of Engineer of Signals has been created on the Main Line of the New York, Lake Erie & Western. Mr. Arthur H. Johnson, until lately with the Johnson Railroad Signal Company, has been appointed to the position. His headquarters are in Jersey City, and he has charge of all the new signal work and of maintenance. In matters of maintenance and operation he is under the orders of the General Superintendent, and in matters of new construction under the Civil Engineer.

Electric Motors for Suburban Service.

There has been a good deal of talk recently about the intention of the Illinois Central Railroad to put on electric motors for its suburban trains. A dispatch of Feb. 2, states that the Board of Directors has concluded to abandon, for the present at least, this idea. A special committee investigated the matter and concluded that the use of electricity for such purposes is not yet sufficiently developed to warrant the change.

Submarine Boat.

In Detroit there is building a submarine boat invented by George C. Baker, of Chicago. The boat has been designed by Frederick A. Ballin, Naval Architect, of Detroit. The propeller shaft can be placed at any angle, and when revolved will cause either propulsion or the submersion of the vessel, as required. This experimental boat will be 40 ft. long, 9 ft. wide, and 14 ft. deep. It is constructed of oak, and is calculated to stand an external pressure of 40 lbs. per sq. in. Steam will be used as a motive power to propel the boat. The smoke stack is connected with an outside cast-iron conduit, which is provided with a check valve, and air for blowing the fires is stored in the hull and is forced out of the smoke pipe into the water by a blowing engine.

A Six-Yard Dipper Dredge.

The Bucyrus Steam Shovel & Dredge Co. is to furnish the dredging machinery for what will be, when completed, the largest dipper dredge in the world. The hull will be 100 x 34, 9 1/2 ft. deep, built of oak with iron truss and head beams, and 30 in. x 30 in. spuds to be hoisted by steam. It will have two engines 16 in. x 18 in., and double gears and frictions. The swinging engines will have 9 in. x 12 in. cylinders and the dipper will have a capacity of 6 cu. yds. The dredge is to be built for Messrs. George H. Boergman & Bros., who have large contracts in and about Maumee Bay.

The Butler Drawbar Attachment.

There is much interest in devices which will prevent the vertical plane car coupler from falling on the track when the fastenings at the inner end are broken, and where such safety devices are combined as in the Butler attachment there is a reduction in the number of parts and gain in the simplicity of construction. The Butler drawbar attachment when used with a strap instead of a tail bolt acts as a safety stop to prevent the drawbar from pulling out when the sills are fractured and the drawbar attachment is pulled out of its fastenings. At such times the shell of the attachment comes against the end sill and prevents the coupler from falling on the track, unless the center, draft and end sills have been totally

destroyed; at least these are the claims made by the manufacturers of the device. Also, as this attachment is more securely held in position by lugs and bolts than the ordinary form of draught gear, it is less liable to be pulled from its fastenings, and, therefore, there is not with it, when the yoke stop is used, the same need for an additional security to prevent the drawbars from falling upon the track.

An Electric Tricycle.

An electric tricycle, worked by storage battery power, is described in a recent issue of the *Revue Industrielle*. The tricycle, which was fitted up according to the design of M. H. de Graffigny, is of the ordinary pattern, the saddle, however, being replaced by a light wooden box which serves equally well as a seat and which contains the working mechanism. There are two chromic acid batteries of 18 cells, weighing, in working condition, about 45 lbs. The current is supplied to a small motor which, through chain gearing, drives the main driving axle. The whole outfit complete weighs only about 154 lbs. and, in a number of trials made during the past two months, is said to have performed very satisfactorily. The motor develops about 1/2 H. P., and, when carrying two persons, the tricycle can attain a speed of about 12 1/2 miles per hour.

Locomotive Boiler Explosions.

On Jan. 22 engine No. 585 of the Reading exploded while standing near a roundhouse. It was a heavy engine, and had been built about two years. No one was near

it at the time, and nobody seems to have been hurt. It is said that the steam pressure was but 80 lbs. How this is known, however, is not stated. This, we understand, was a Wootten boiler.

Another explosion occurred in St. Clair, Pa., on the morning of Jan. 28. Five men were killed, being engineer, fireman, conductor and two brakemen. This was locomotive No. 956 of the Philadelphia & Reading, which was standing on a siding at Newcastle, a mining village. The men killed were standing around the engine at the time of the explosion. The locomotive was one of the Cushing type, which was shown in much detail in the *Railroad Gazette* of Jan. 4, 1889. The general arrangement of the firebox is shown in the accompanying sketch.

Another explosion is reported on Feb. 2, of engine No. 47, Chicago & Alton, a mile south of Joliet. The locomotive was pulling a heavy freight, with a pusher helping, over a grade. The explosion happened just as the engine had reached the top of the hill. Two were killed and one severely, perhaps fatally, wounded.

A Complete Operative Model of a Locomotive.

In the little town of Piedmont, on the Baltimore & Ohio Railroad, Stephen Paganhardt, a young mechanic, has constructed a locomotive model which is probably the most complete that has ever been built to so small a scale. It is about one eighth size, and has every detail complete and operative that is used on a full sized locomotive. Even the injectors were specially constructed and operate under steam pressure. There are operative steam gauges, whistle, safety valves, air brakes, air pumps, etc. It will be exhibited at the World's fair.

Electric Drills in Europe.

The advantages of portable electric drilling machines which, within the past few years, have found considerable application in this country, are apparently now being more widely recognized abroad and foreign journals have, of late, illustrated and described a number of appliances of this class. One of the latest is of French make, being turned out by Messrs. Sautter, Harlé & Co., of Paris. The illustrations of it, given in the *Revue Industrielle*, show a complete outfit designed particularly for ship use, in drilling ships' plates, etc. It embraces a trolley arrangement for taking the current from the main circuit, a rheostat, and an electric motor, transmitting its power to a drill by means of a flexible shaft.

Steel Ties in India.

With the relaying of the Prome (Burma State) line, the new steel trough sleeper is superseding the time-honored timber sleeper in certain parts. These sleepers are certainly the best type of metal sleepers yet introduced. It has no tie rods to break or loosen from wear and tear, no cotter pins to work loose and fall out, there being no chairs and spikes to be removed, which for the new flanged rails are still required when timber sleepers are used. With all these advantages, timber sleepers cannot be discarded altogether, as for all points and crossings where greater lengths are required timber sleepers must be used.—*Indian Engineering*.

An Aluminum Light.

M. Villon proposes, in the *Revue de Chimie Industrielle*, to replace the magnesium light, now so extensively used for photographic purposes, by an aluminum light. Aluminum, he points out, costs only one third as much as magnesium, and burns in much the same manner as the latter metal, only more slowly. In the oxygen-hydrogen flame it burns with an intense light without producing smoke, which is a most important feature, and which is held to constitute a great advantage over magnesium.

THE SCRAP HEAP.

Notes.

The transfer of the stock yards at East St. Louis to the new Chicago owners was consummated Jan. 27, and the President of the company is now Edward Morris, of Chicago. The Treasurer is E. F. Swift.

The shops of the Queen & Crescent road at Meridian, Miss., were burned Jan. 27, only the offices and round-house being saved. A large freight house of the Cincinnati, Hamilton & Dayton in Cincinnati was burned last week.

The annual meeting of the Railway Employes Club of Minnesota was held in St. Paul, Jan. 27, 62 branch clubs in different parts of the state being represented. The President of the state club is John B. Copeland, of Crookston, and the Secretary, W. E. Perry, of Minneapolis.

An arrest was made at Charlotte, N. C., last week, of the man who, it is claimed, caused the wreck on the Western North Carolina road near Statesville, N. C., last September. A circumstantial account of his apprehension is given and it is said that he has made a confession.

Senator George, of Mississippi, has introduced a bill in Congress making transportation companies liable for injuries to employes, the principle of the proposed measure being similar to that of the law now in force in Massachusetts, which materially changes the old common law rule relieving the employer where there is negligence of a fellow employe.

Large meetings of railroad brotherhoods were held in New York City and in Indianapolis on Sunday last. That in New York City was under the auspices of the Order of Railway Conductors, and is claimed to have been attended by 2,000 delegates. Prominent members of the Firemen's, Trainmen's and Telegraphers' brotherhoods were present. The reports indicate that proposed legislation in New York State was the chief subject under discussion.

Sensational accounts were printed last week to the effect that the Long Island & Eastern States Express, running between Brooklyn and Boston, via Oyster Bay, Wilson's Point and Hawleyville, was to be taken off on account of lack of business; but on the following day the officers of the road stated not only that the train would be continued, but that a day train would be put on in the spring. It seems, however, that the train has failed to make time, and has made no astonishingly large profits. The schedule is to be lengthened half an hour. The report that the New York & New England is to be double tracked between Hawleyville and Hartford still seems to be based chiefly on rumor.

The labor unions at Butte, Mont., have fixed \$3 per day as the minimum wages to be paid laboring men in that vicinity. Foley Bros. & Guthrie, of St. Paul, recently began work on a spur track from the Montana Central to some mining properties, and paid their laborers \$2 per day. On Sunday last the unions not having succeeded in frightening either the contractors or the men, a mob of 2,500 men went to the camp and compelled the men to pack up their effects, which were loaded into the contractor's wagons and their horses used in bringing them into Butte. The captured men were taken to the miners' union hall, compelled to join the workmen's union, then allowed to shift for themselves. The authorities offered no opposition to the mob's lawless actions.

Spanish American Notes.

A very determined resistance to the proposed amalgamation of the Central Argentine Railway with the Buenos Ayres & Rosario Railway has arisen on the part of some of the stockholders in the former. It is pointed out that the traffic on the Central Argentine consists to a greater extent of general merchandise than that of its rival, and is consequently less liable to suffer a permanent decrease. The reduction in freight rates is also charged to the effect of river transportation rather than to railroad competition. On the other hand, stockholders in the Buenos Ayres & Rosario claim that they have nothing to gain by fusion except a reduction of operating expenses, and considering the prospective Bolivian traffic, which will be very large, and which the Rosario line can more easily secure, owing to its having the same gauge as that on the National Central Northern Railway to Salta and Jujuy, they prefer to take their chances against competition from the Central Argentine.

Recent rumors of political instability in Argentine have been contradicted, and Argentine securities are improving. The late advance in the gold premium has been counteracted by the shipment of \$2,000,000 gold from London with the knowledge that more is soon to follow. There have been some election riots, and will continue to be until the elections are held on April 1, but such incidents must not be confounded with popular uprisings.

The extension of the Argentine Central Northern Railway north from Jujuy toward the Bolivian frontier has been so poorly constructed that the government engineers refused to accept it, and \$965,000 will be required to bring the work up to the standard of the specifications.

Señor Luis Jordan, member of the Chilean Chamber of Deputies, who, it will be remembered, has always advocated an apology from his government to the United States on account of the "Baltimore Affair," is now urging the purchase of some new equipment, including many freight cars and a number of locomotives, for the government railroad lines.

A commercial treaty between Brazil and Uruguay is being negotiated, which, if concluded, will greatly increase trade between the two republics.

The telegraph line which the Brazilians are building

into the isolated middle and western portion of the republic, is being continued at a very creditable speed. Within six months it had been carried westward from Goyaz 131 kilometres to the mining town of Rio Claro, whence it will be pushed on to the Registro de Araguaya, and inside of two years will probably be open to Cuyabá. This is of great importance since it will hasten the building of a railroad to Cuyabá and Northeast Bolivia, which will thus open up a rich region and fix its trade relations with Rio de Janeiro instead of allowing them to profit Buenos Ayres, or to languish through the partial facilities of an Amazonian water route.

The Mogayana Railroad, State of Sao Paulo, is also constructing a telegraph line northward from its terminal at Ribeirão Preto to connect with the Goyaz line at Uberaba, which would seem to indicate an intention on the part of this enterprising and prosperous Brazilian corporation to extend its railroad in that direction. The President, Baron de Ataliba Nogueira, has announced that the company will lay a second track from Campinas to Ribeirão Preto, with or without the concession to build to Santos. They will also at once undertake the construction of two branch lines.

Pedro de Magalhães of Campinas, State of Sao Paulo, Brazil, has asked for a concession to supply that city with electric power, to be transmitted from works utilizing waterfalls on the Rios Atibaia and Jaguary.

Of the total, 10,832,000 lbs. of heniquen, or Sisal hemp, exported from Progreso, Mexico, in Nov. 1891, 5,469,000 lbs., went to Boston, and 3,687,000 lbs. to New York.

Some time ago the Central & South American Cable Co., an American enterprise, acquired the land lines of telegraph connecting Valparaiso with Buenos Ayres. The English, perceiving that all their communication with the west coast of South America must consequently pass through American agencies, promptly organized a new company, which has already shipped the material for a trans-Andine line of their own between the same points.

Practically all clearances are now made through London in our South American commerce. Mr. Bacon, of New York, introduced into the House of Representatives on Jan. 29 a bill providing for the incorporation of an International-American Bank. This bill fixes the capital at \$5,000,000 which may be increased to \$25,000,000, fifty thousand shares to be subscribed before the bank may begin operations. The following gentlemen are named as commissioners to take subscriptions for stock: C. N. Bliss, Chas. H. Flint, New York; Jefferson Coolidge, Massachusetts; Andrew Carnegie, Pennsylvania; Enoch Pratt, Maryland; J. F. Hansom, Georgia; Chas. H. Turner, Missouri; and S. O. Thomas, California.

Deep Waterways.

A large number of persons interested in securing deeper channels on the lakes, a delegation from the Detroit convention of December, appeared before the Committee on Rivers and Harbors in Washington on the 30th ult., asking for an appropriation of \$3,344,000 for deepening the lake channels, and another appropriation of \$100,000 for a survey to show the best route for continuing the deep water to the sea. The large appropriation asked for is to be expended through a term of years, so that contracts can be made for the whole work instead of for one year only, as has been the general practice of Congress in dealing with river and harbor improvements. If this appropriation is made by the present Congress it is thought that the work can be all completed by the spring of 1896 when the new lock at the " Soo " is to be finished, and there will be a 20-ft. navigation throughout the lakes. President James J. Hill, of the Great Northern Railroad, says when this is done, he will put on boats of 6,000 tons and cut the freight rates in two! The average freight rate on the lakes for 1891, is asserted to have been 1.3 mills, and if Mr. Hill can carry for a moiety of that, his boats will undoubtedly be full. The Canadians, it was asserted, have expended \$600,000,000 on their canal system and the improvement of the St. Lawrence, while our expenditures on the entire lake system, has been but \$30,000,000.

According to German journals the Prussian railroad authorities have found the study of railroad practice in the United States alike interesting and profitable, and the experiment tried last year of sending to this country German officials to examine into and report upon American methods is likely to be repeated. Recent visits are said to have shown that our railroads are decidedly superior to the German roads in point of organization and management, and they are accordingly recommended as desirable examples for further study.

Elevated Tracks in Chicago.

The Mayor of Chicago has returned from an Eastern trip, where he has been examining the elevated road systems, and reports that the time is near at hand when the roads entering Chicago must be elevated. He has said that the elevated terminals in Philadelphia and Jersey City are not only profitable to the railroads themselves, but a blessing to the people.

The Philadelphia & Reading Relief Association.

A statement of the operations of this association for the year ending Nov. 30, 1891, shows receipts of \$252,703, payments, \$212,253, and a net surplus of \$40,449. Benefits were paid during the year in 5,575 disbursement cases and in 191 death cases, 78 of the latter from accidents and 113 from natural causes. The membership was 15,035.

Railroad Accidents in France.

[From a French Correspondent.]

Since the St. Mandé accident the attention of the public here has been repeatedly called to other minor accidents, and the French press is impressing upon its readers that there is an enormous railroad accident wave sweeping the country, whereas the fact is that the accidents were always happening before, but were not of serious importance, or were hushed up before the opportunity was given of spreading the news, a kind of practice said to be largely resorted to by the great lines between Paris and South France. One in November was at Grenoble, southeast of Lyons, on the Paris, Lyons & Mediterranean line, the initials of which, "P. L. M.," are popularly held to signify "Pour la Morgue," as indicating the ultimate destination of all travelers who venture on this great and important railroad.

A train left Lyons at 11:50 a. m. for Grenoble where it was to arrive at 4:32 p. m., and was composed of 14 heavy P. L. M. cars hauled by two engines—one an express and the other a freight locomotive, and, when at the 68th mile-post (110 kilometres), the second engine jumped the track while the train was moving at 40 miles per hour. It at once ploughed deeply into the permanent way while the foremost engine, snapping the coup-

plings, darted ahead. Five of the first carriages were thrown from the road and more or less smashed up, and three persons were killed and 20 injured. The effect of the Westinghouse brake is said to have been curious. The conductor, thinking they were traveling at an abnormal rate of speed, got up into the watch box of his car, where, seeing the train was off the rails, he applied the full force of the brake. As the leading engine (No. 2,308) was not fitted with this brake, it might have been supposed that it would have immediately snapped the drawbar pin, or, in case of not doing that at once, it would have hauled the derailed locomotive along so as to keep the latter's couplings tight with the train. Unfortunately this did not happen. At the jerk the first engine rebounded on the second (No. 550), which then twisted round broadside to the track, and then, with the second rebound, No. 2,308 pulled out the drawbar from the other and continued on its road. The accident may therefore be considered to have been made thus serious by the momentary stoppage of the first engine.

Ethics of Passes to Editors and Judges.

The Commission, however, does not prohibit the granting of passes to newspaper men, hotel proprietors, etc. . . . It would have been more consistent if the Commission had made a ruling which would cover all cases, as it must often happen that in a certain town another man than a hotel proprietor or an editor may be as able to render a fair return for a pass, and consequently as well entitled to it in all justice. As regards public officials, there can be no dispute as to the soundness of the decision. It is a reproach to the community that so many men in such a position are ready to use such passes, and the law should be invoked to end the abuse, if nothing else will serve. It is a waste of time to argue that a judge or a legislator is not affected by a pass. Human nature being what it is, he is influenced, consciously or unconsciously.—*New York Evening Post.*

Interviewing an Engineer.

I thought from the general appearance of the man, and from the way he looked up every time the whistle sounded, that he was a railroad engineer, and when I made bold to ask the question I found I was right. After we had conversed for a few minutes on general topics, I asked:

"I suppose you have had your share of narrow escapes?"

"Yes, but not on the rails," he replied. "I was once shot at in a saloon, and I once fell off the roof of a church. I never had an accident on the road."

"Were you never flagged for a bridge carried away by a freshet just in time to prevent an awful calamity?"

"Never; bridges always all right."

"Ever almost crash into another train?"

"Never."

"But you've run over people?"

"Never did, sir. People always get out of my way."

"You have at least been very anxious when rushing through darkness with hundreds of lives in your keeping?"

"Yes—anxious to get home, I suppose, but I don't remember any particular instance."

"I wasn't at all satisfied thus far, and, after pausing to take breath, I asked:

"Were you ever startled by thinking you saw an open switch when too late to stop the train?"

"No, sir; switches are always all O. K.," he replied.

"I have been told that some engines seem to be possessed by human intelligence?"

"Yes, I suppose so; but we don't use that kind on our road."

"Many brave men have died with their hand on the throttle."

"I presume so, but I don't want to die that way. I want to die at home in my bed."

"I was determined to get something out of him for a sketch, and so I persisted:

"Did you never have your fireman go crazy while on a run?"

"Never."

"But you must have been prepared at some time or other to sacrifice your life to save your train?"

"No, sir; I never have. You don't seem to understand the business. I simply run to Chicago and back, and sometimes make as high as \$110 a month. That's about all there is to it, and if you are after perilous adventures you should interview street car drivers. I understand that they take their lives in their hands every day in the year."—*Detroit Free Press.*

A Red Flag or a Red Tongue.

Pittsburg is noted for its railroad romances, and here is the latest, modestly dated at an unassuming suburb: *Wilkinsburg, Pa., Jan. 29.*—A 10-year-old lad named Moffat, at Edgewood, set out the other night to show companions how cold Pennsylvania Railroad rails were.

He did. Sticking his tongue on a rail he was at once frozen down to it. The day express was due in 10 minutes. It had to be flagged while the station agent heated water, warmed the rail and released the lad. . . .

Lake Affairs.

Contracts for the transportation of over a million tons of iron ore from the head of Lake Superior have been made at the rate of \$1.25. This is 25 cents better than the season's price for 1891. The factors considered were the prospect of large ore shipments, an increased demand for coal, the grain crop and a strong probability of low water. Under these circumstances vessel owners could probably place a still larger tonnage at the same price.

Large sales of ore to Carnegie and the Illinois Steel Company at an advance of 35 cents per ton are reported. The amount is uncertain, but it is rumored that the purchases cover the season's requirements of the two concerns, viz., 3,000,000 tons.

Ten steamers are now plying across Lake Michigan, carrying flour, mostly to the eastern trunk lines. The Delaware, Lackawanna & Western has established a route between Keewanna and Frankfort, where freight is delivered to the Toledo, Ann Arbor & North Michigan Railroad. It is rumored that the large whaleback steamers "Pittsburgh" and "Washburn," now building at West Superior, to run between Gladstone and Buffalo, in the service of the Canadian Pacific, will be run through the winter months between Milwaukee and Grand Haven. The Goodrich Transportation Co. is said to intend contracting with the Detroit Dry Dock Co. for a new boat fully equal to the "Virginia," which was turned out last spring.

Enlarging the Broad Street Station.

The Pennsylvania Railroad has given orders to Wilson Bros. & Co., of Philadelphia, to prepare the plans for the addition to the Broad street station in Philadelphia. The old buildings at Broad and Market streets are

under contract to be removed by March 15, and the company desires to begin the construction of the new addition without unnecessary delay after that date.

Overtime Must Be Scarce Out There.

The Cleveland *Leader*, having boasted of the speed made by freight trains on the Lake Shore, received a letter from a conductor running stock trains on the Burlington & Missouri River. He says: "I have made the run from Akron, Col., to McCook, Neb., a distance of 143 miles, in exactly three hours and fifty minutes, taking water and coal as needed, and that with a hog engine with eight drivers. This is a common run over that division, and that on a single track road. If you wish to see freight cars roll come out to what was the 'Great American Desert.' That is the road where seven loaded cars, without an engine, were driven 100 miles by the wind one night a few years ago. Perhaps the wind got after this conductor."

An Important Decision About Street Railroad Crossings.

An adverse decision has been rendered in the Supreme Court of Illinois in the application made by the Illinois Central to prevent the city of Chicago from opening certain streets in Hyde Park across the right of way of that railroad company. It was decided by Judge Tuley that the city had not given up its rights to street crossings when it granted the Illinois Central the right of way into the city. There is some prospect of this case being appealed to the Supreme Court of the United States. The effect of this decision, if sustained, will be practically to compel the Illinois Central to elevate its tracks for the reason that it cannot run the large number of trains now scheduled on suburban lines with so many grade crossings without serious delays.

Twenty Years' Coal Production in the United States, Great Britain and Germany.

Mr. John Birkenbine's address as President of the American Institute of Mining Engineers and an article in the *Colliery Guardian* comparing the mineral production of the United Kingdom and Germany, enable us to present the following table showing the production of coal in the three countries for 1870 and 1890, with the absolute and relative increase in each country:

	1870.	1890.	Amount.	Percentage.
United States....	29,281,848	126,067,780	96,815,932	330.6
United Kingdom...	110,431,000	181,614,000	71,182,000	64.4
Germany.....	26,398,000	67,342,000	40,944,000	155.1

"Important, if True."

The Empire State express made a remarkable run Monday. Owing to a freight collision at Lyons the train was sent from Clyde to Newark on Track 1. It arrived in Rochester 19 minutes late, but reached Buffalo only 8 eight minutes late. The run from Crittendon to Grimesville, a distance of 10 miles, was made in six minutes [100 miles an hour].—*Buffalo paper*. But it isn't true. The time table takes four-tenths of a mile off the distance, and the train sheet adds a fraction to the time. But 80 miles an hour is not slow.

United States Patent Office Building.

We have received from the Association of Inventors and Manufacturers a copy of a circular which is being distributed calling attention to the pressing need of additional room in the patent office building. The entire building substantially as it now exists was planned about 1886. The examiners and clerks are very much overcrowded, even occupying basement rooms never intended for offices. The health of the force is impaired and their work much retarded by these conditions. At the same time the office needs more clerks to bring up the work to date and keep it there. It is suggested that senators and representatives in Congress be urged to bring about legislation to better the condition of the office.

Strike While the Iron is Hot.

The following communication has been addressed by Mr. J. S. Leeds, Traffic Manager of the California Traffic Association, to all the members of the association:

"SAN FRANCISCO, Jan. 6, 1892.
"Advices have been received at this office of a reduction in freight rates from San Francisco to Puget Sound points, and I take occasion to urge upon members the desirability of making the best possible use of these rates while they exist to extend their trade into what may be termed debatable territory with other markets. It appears to the undersigned that the conditions are favorable for gaining a foothold in the northern trade with the view of holding at least a fair share should the rates go back even to the old standard, besides showing to the carriers that a lower standard can be made profitable by the increase of tonnage which it brings to them.

The reductions alluded to are those made by the Pacific Coast Steamship Company. This is the first circular emanating from the Traffic Manager's office to be made public.

The Proper Dignity of a Passenger Agent.

The subjoined paragraph is from an article in the Springfield (Ohio) *Republic Times*, on the conduct of passenger business, with special reference to the Pennsylvania lines. From the internal evidence of careful preparation, it is evidently the work of one of the accomplished literary men in the Pennsylvania passenger department; in other words, it may be taken as official, although it appears as news. The article begins with a condemnation of the man who goes about for the purpose of seizing passengers by the nape of the neck and hauling them into the office, who deems it necessary to be hale fellow well met with every one he meets, regarding no terms of praise too extravagant for his own line, and no words of condemnation too strong for his rivals; who belagues farmers intending to emigrate, courts the favor of army officers controlling the movement of troops, treats with great deference the advance agents of circuses, theatrical troupes and baseball clubs, "sets 'em up" to newspaper reporters and knows as many "funny stories" as any commercial traveler. The closing paragraph says:

This undue solicitation of traffic had evil effects in other ways. The passengers secured by solicitation were often accorded privileges and accommodations that were denied the regular everyday patrons of the railway who paid regular fares and never came in contact with the passenger solicitor. In so far as the Pennsylvania lines are concerned it has been decreed that undue solicitation and all undignified reaching for popularity shall cease; that communication with the company's patrons be conducted with due regard for the amenities of business intercourse; that intending passengers be neither ensnared nor cajoled, but politely given exact information and permitted to purchase tickets or not as they choose. It is the intention that no passenger be given a secret advantage over another, that the great numbers of those who contribute most largely to filling the passenger trains and contribute the greater portion of the passenger revenue may go to the regular ticket offices and obtain equal accommodations at equal

rates with those who privately seek the passenger agent's ear.

This reform is made possible by the abolition of commission paying. The practice of going out into the highways to "hustle" for business naturally goes with the commission-paying system. The Pennsylvania, which has been the most persistent resistant of that system, has been consistent in the matter, increasing the salaries of many of its ticket sellers to more or less fully compensate for the commission money they have been deprived of.

Securities Listed on the New York Stock Exchange.

Chicago & Erie—\$883,000 first mortgage bonds, making the amount listed \$12,000,000. The bonds listed are the last of \$2,000,000 reserved in the reorganization plan for betterments and equipment.

Buffalo, Rochester & Pittsburgh—\$827,000 general mortgage five per cent. bonds making the amount listed \$2,571,000. Of the new bonds \$291,000 retired other issues and \$536,000 were used for improvements.

Lehigh Valley—\$1,000,000 first mortgage 4½ per cent. bonds, making the total listed \$10,500,000, and \$1,500,000 remain to be issued as required. The bonds are issued on the Buffalo extension.

Cleveland & Pittsburgh—\$3,000,000 general mortgage 4½ per cent. bonds guaranteed by the Pennsylvania Railroad; \$2,110,000 of the bonds are used to retire prior liens, and the balance goes to the Pennsylvania for improvements made and to be made.

The Future of Railroad Management.

Woman rules the world. Every one admits the fact. But not all railroad men fully realize it, for the reason that the hand of power is so softly gloved. Moreover, the rule of women in railroad affairs is characterized by much greater subtlety than is found in other matters bossed by them. Direct rule is coming, however, and, to make short work of a painful story, we announce it without further cushioning. It comes in a report of a discussion at Smith College (for women) at Northampton, Mass. We take it from the *Springfield Republican*:

"The Smith College juniors had a general discussion on the grade crossing question yesterday. Miss Jordan presided. All the class had to be prepared, as, beyond the leaders, the speakers were called up without notification. Miss Julia Dwight led off in favor of the plan submitted by the special commissioners, and Miss Frances Darling opposed that scheme. She gave figures to show how many had to cross over the tracks. Florence Barry, of Chicago, thought the railroads had some rights that should be respected, while Marie Woolen vigorously assailed the plan as outlined by the commissioners. Martha Adams boldly struck out for the so-called meadow plan, as by that it would be necessary to bridge only one street. Harriet Burrows was in favor of raising the tracks, and said the railroads could pay the bills without much trouble, while Bertha Smith was decidedly opposed to the meadow plan, and would much rather leave matters as they were; and Florence Robin was afraid horses might tumble off the toy bridges which are to go over the tracks. The students are to hand in their written opinions as to which side won, and Miss Jordan will announce the decision."

This shows what women might do on railroads. Miss Dwight might just as well be a General Manager as to devote her life to poetry. Frances seems to be a "kicker," but a kicker who gives figures is a power in railroad management. And just to think of the Western girl recognizing the rights of the railroad! The Chicago & Northwestern needs her. Charles Francis Adams has been off the Massachusetts Railroad Commission now a good many years, but it is good to see that the state still boasts an Adams who will "strike out boldly." The lady who wishes to Burrow under the tracks has common sense on her side, but in saying that the railroads "can pay the bills without much trouble" she gives herself away (figuratively, not literally, by any means), and, we fear, reveals the animus of the whole lot of 'em. This feminine notion is what makes most of the trouble in the world, and we fear Doctor Seelye's girls will not do for railroad managers this year, after all.

Rain-Making in India.

We have warned Uncle Jerry that the servile races inhabiting Hindustan might steal some of his thunder, but the following from the *Indian Engineer*, accounts for his composure in face of what we had imagined was his danger: "Rain-making experiments conducted at Bijapur by the collector and two engineers have proved futile. The Hon. Mr. J. Nugent, reporting thereon, hopes the experience thus obtained may be useful in future as discouraging false hopes and preventing further outlay to no avail. According to the collector 750 lbs. of dynamite were used, but the explosions were unfortunately made when the sky was absolutely clear of clouds, and there was every appearance of cold, settled weather."

LOCOMOTIVE BUILDING.

The Missouri Pacific is in the market for 50 engines. The Louisville & Nashville placed an order this week for 20 heavy freight locomotives. The Duluth & Iron Range has ordered eight heavy freight engines from the Schenectady Locomotive Works.

CAR BUILDING.

The Chicago & Northwestern has ordered 250 stock cars of new design from the Terre Haute Car & Mfg. Co. The contract for 100 of the cars for the new cable line on Broadway, New York City, has been awarded to the John Stephenson Co., of New York.

The Ensign Manufacturing Co., of Huntington, W. Va., has taken a contract for 500 new cars for the Louisville & Nashville, to be completed before July.

The Central of New Jersey has recently placed an order for 1,000 hopper gondola coal cars, of 50,000 lbs. capacity and also for 250 box cars with Eastern car firms. The cars will be equipped with air brakes and the Janney coupler will be on both gondolas and box cars.

BRIDGE BUILDING.

Belmont County, O.—The County Commissioners of Belmont County, O., will have five new highway bridges to build early this spring over McMahons and Wheeling creeks. The cost of the five is estimated at \$300,000.

British Columbia.—It has been decided to construct a bridge across Vedder Creek, British Columbia, a single span of 140 ft.

Duluth, Minn.—The Board of Public Works is asking for bids for the Lake Avenue viaduct. The structure will be of iron and steel, will be 684 ft. long and will cost from \$50,000 to \$60,000.

Knoxville, Tenn.—Hall & Hough have received a contract at \$20,000 for grading the approaches to the bridge for the Marietta & North Georgia Railroad to be built across the Tennessee River.

Minneapolis, Minn.—The Great Northern has awarded the contract for the steel superstructure of the bridge across the west channel of the Mississippi River to the Edge Moor Bridge Works, of Edge Moor, Del. It is a five span, double track bridge, and is to be completed by June 25, 1902. There will be two truss spans each 173 ft. in length, and three girder spans, 57, 70 and 82 ft.

Ottawa, Ont.—It is proposed to build a bridge to cost \$30,000 across the Rideau River, at Ottawa, Ont., the work to be jointly by the city and the county municipal councils.

Parkersburg, W. Va.—Jolly Bros. have the stone work for the new highway bridge over the Kanawha River at Parkersburg finished except the cap stones, which will not be laid till the iron work is on the ground. The work of erecting the superstructure will be commenced as soon as the ice runs out of the river.

Randolph County, W. Va.—The Pittsburgh Bridge Co. and the County Court of Randolph County, W. Va., are having some little difficulties just now on account of an error in the matter of building the foundation for a bridge over Tygarts Valley River. When the superstructure arrived it was found that the bridge piers were just two feet too far apart. The bridge company, holding the Commissioners responsible, asked that they either build up the foundation new or pay for lengthening the bridge, both of which the Commissioners refuse to do.

St. Paul, Minn.—A bill extending the time for completing a railroad and wagon bridge across the Mississippi River, by the Belt Line Bridge and Railroad Co., has passed the lower house of Congress. The bridge will extend from South St. Paul on the west bank of the river to St. Paul Park on the east. Bonds to the amount of \$105,000 have been voted to aid the construction of this bridge; of this amount \$75,000 will be issued by South St. Paul and the town of Newport \$30,000.

Shreveport, La.—It is reported that the St. Louis Southwestern Railroad will construct a railroad bridge across the Red River, at a cost of about \$200,000.

White Plains, Ala.—J. T. De Arman, Jacksonville, Ala., is receiving proposals for the construction of an iron or wood highway bridge near White Plains, Ala.

Williamsport, Pa.—A company is being formed among business men of Williamsport, Pa., Hagerstown, Md., and Martinsburg, W. Va., for the purpose of building a bridge over the Potomac River at a point which will give the greatest convenience to the three towns. Estimates of the cost of the bridge have been made, and it is thought it can be built for \$50,000.

Yarmouth, Nova Scotia.—The new passenger bridge built by the Dominion Bridge & Iron Co. over the Tuskent River, Nova Scotia, connecting Yarmouth with Argyle, was completed last week. Contractor W. E. Browne, of Digby, had the contract for its erection. The structure consists of three spans, each 65 ft. in length and 18 ft. wide.

RAILROAD LAW—NOTES OF DECISIONS.

Carriage of Goods and Injuries to Property.

In New York it is held by the Court of Appeals that a carrier, which had entered into a contract with a shipper for the transportation of goods, had no right to make inconsistent stipulations with the persons who delivered the goods for the shipper; and provisions and conditions in the shipping bills, signed by such persons without the knowledge of the shipper, limiting the liability of the carrier to points on its own road, are not applicable to the shipment in question.

In Arkansas the Supreme Court rules that under the statute of 1887, which provides that a common carrier of freight shall load, transport and unload freight for the one charge for transportation, defendant could be excused from unloading the brick on the ground only that plaintiff voluntarily bound himself by agreement, express or implied, to unload it. And that where the rate was eight cents per 100 lbs. for hauling brick, and but 4½ cents for stone, it was a circumstance which the jury might consider in determining whether the charge for brick was unjust or unreasonable.

In Georgia the Supreme Court decides that the ship per of live-stock under a special contract in which he agrees that, "in case of accidents to or delays of time from any cause whatever," he "is to feed, water, and take proper care of the stock at his own expense," cannot recover damages resulting from his own failure to perform his part of the contract, although the company may have consumed more time than necessary in effecting the transportation.

In New York the Supreme Court rules that where a railroad delivers goods to the consignee, in violation of the instructions of the shipper to the company's agent not to deliver without a bill of lading, the company is liable to the shipper for the loss thereby sustained by him.

In Texas an insurance policy on cotton consigned from Texas to Liverpool stipulated that it was not to cover the common law liability of the common carrier, but that if the cotton were lost while in the care of any common carrier, the underwriter should "advance" to the assured an amount equivalent to the insured value of the cotton so lost; and, if the carrier proved liable, the assured should return to the underwriter the amount received from the carrier. The Supreme Court decides that a railroad to whom the cotton was consigned was liable for loss resulting from its negligence, though the bill of lading stipulated that the company should have full benefit of any insurance that had been effected on the cotton. The "advancement" by the underwriter to the assured of the insured value of the cotton does not constitute a "payment" in such sense as to preclude the assured from recovering from the railroad company the amount of its common law liability.

In North Carolina the Supreme Court rules that where a mortgagor of land grants a right of way to a railroad company without the consent of the mortgagee, and without any proceeding against the mortgagee to condemn the land, the mortgagee's interest is not affected, and the purchaser at a foreclosure sale under the mortgage, or his grantee, may sue the company for compensation, though he cannot recover damages incident to the entry before he acquired title.

Injuries to Passengers, Employees and Strangers.

In Michigan the Supreme Court rules that a traveler on the street has a right when he comes to a railroad

track, not merely to cross it squarely, but to walk upon it in getting off the street to a more direct route; and he is not a trespasser so long as the track continues along the street.⁷

In Kansas as it approached the crossing of another railroad in a city of 5,000 inhabitants, a freight train stopped not to exceed a minute, so as to block one of the principal streets of the city near a public school building. A boy seven years old tried to climb over the cars. He was not seen by the trainmen. The train started, and he was thrown off and injured. The jury found that the company was negligent, in that the trainmen knew that the crossing was frequented by children, and were not on the lookout. The Supreme Court holds that there was no evidence of negligence on the part of the company.⁸

The Supreme Court of Colorado rules that a laborer engaged in constructing a railroad, if unskilled in such work, even if he has aided in repairing defects in the newly constructed road, is not necessarily chargeable with notice of such defects, so as to preclude his recovery for injuries caused thereby while being transported over the road to his work.⁹

The Supreme Court of California rules that a railroad is liable for injuries received by a child while playing upon a turntable upon its premises near a public street, which was not protected by any inclosure nor guarded by its employees, though it was provided with the customary fastenings to keep it from revolving, and the child was invited to play thereon by other children.¹⁰

On the other hand in Massachusetts it is decided by the Supreme Federal Court that a railroad owning a turntable situated on the company's land, about 600 ft. from two highways, and having upright guybars, is not bound to keep it locked on the ground that it is an attractive object to children, and a child injured while playing thereon cannot recover.¹¹

In South Carolina a statute requires locomotive engineers and firemen on trains, when approaching any public highway or "traveled place," to signal, either by a bell or whistle. The Supreme Court holds that "a traveled place" means a place where the public have a legal right to cross the track, and not a place where people are accustomed to cross to reach a store or post-office, where such crossing was not a public one, and the railroad company did not know of or acquiesce in such crossing.¹²

In Michigan a boy of average intelligence, 14 years old, was hurt on a crossing while going to his work; as he approached the crossing, walking in the middle of the street, he saw an engine standing close to the easterly side, with one man on board, and its rear end toward him; upon reaching the track he changed his mind about crossing, and turned his back on the engine, intending to walk between the rails to the westerly side, where the depot was, and so get upon another street by way of the depot platform, but after he had taken two or three steps in that direction the engine backed up without warning, and frightened him so badly that he was unable to make his escape. The Supreme Court holds the railroad liable.¹³

In Colorado the Supreme Court holds that a servant cannot knowingly incur unusual danger at the risk of his master; but, if the unusual danger is not apparent to a mind like his, and he does not know nor have the means of knowing it, he may incur such danger, under the order of his master or his representative, without being guilty of contributory negligence.¹⁴

In Michigan the plaintiff was injured coupling freight-cars on the east end of defendant's train, which was long, and stood on a curved track. The train was sometimes made up by the night men, and when plaintiff came on duty in the morning he supposed it was made up except the cars which he was coupling. The injury was caused by a movement of the train by the engine working on the west end. He had been in the yard only a month, and had had no other experience in switching. He had no notice of the engine working on the west end, or that the train was going to be moved. There was evidence tending to show that the yard master, under whose instructions plaintiff was working, was incompetent. Plaintiff knew nothing of the master's qualification, and had never worked on the end of the train while a crew was working on the other. On such occasions the master usually gives notice when the train is liable to move. The Supreme Court holds the railroad liable.¹⁵

In Vermont the deceased had been employed as car inspector and repairer in a railroad yard of a city for 14 years, and had full knowledge of all the operations therein. It was in his discretion to determine whether cars should be repaired on the tracks or removed to the shops. He also determined the capacity of the helpers needed for the repairs. A certain car needing repairs, he decided that the work should be done on the side track, and a certain man was furnished to help him, to whom he made no objection. This man had worked in the yard for 20 years, and the inspector well knew whether he was competent or not. While making repairs under the car the inspector was fatally injured by a train noiselessly switched against it. The Supreme Court rules that the deceased was negligent and the railroad not liable.¹⁶

In Michigan the plaintiff was unloading barrels from his wagon onto a car when his team became frightened by a moving car and threw him from the wagon, thereby causing the injury. The team had run away with him and with others before. The Supreme Court rules that it was proper for the jury to consider whether he was guilty of contributory negligence in having the team where it was liable to become frightened.¹⁷

- ⁷ Jennings v. G. T. Ry. Co., 23 N. E. Rep., 394.
⁸ L. R. & Ft. S. Ry. Co. v. Bruce, 17 S. W. Rep., 363.
⁹ Boaz v. C. R. & B. Co., 13 S. E. Rep., 711.
¹⁰ Foggan v. L. L. & M. S. Ry. Co., 16 N. Y. S., 25.
¹¹ G. C. & S. F. Ry. Co. v. Zimmerman (Tex. sup.), 17 S. W., 238.
¹² Livermon v. Roanoke & T. R. Co., 13 S. E. Rep., 734.
¹³ Fehrich v. Mich. Cent. R. Co., 49 N. W. Rep., 891.
¹⁴ A. T. & S. F. R. Co. v. Plaskett, 27 Pac. Rep., 824.
¹⁵ Col. Mid. Ry. Co. v. O'Brien (Colo. Sup.), 27 Pac. Rep., 701.
¹⁶ Barrett v. Southern Pac. Co. (Cal.), 27 P., 666.
¹⁷ Daniels v. N. Y. & N. E. R. Co., 28 N. E. Rep., 283.
¹⁸ Barber v. R. & D. R. Co., 13 S. E. Rep., 630.
¹⁹ Fehrich v. M. C. R. Co., 49 N. W. Rep., 892.
²⁰ Col. Mid. Ry. Co. v. O'Brien, 27 Pac. Rep., 701.
²¹ Lee & Michigan Cent. R. Co., 49 N. W. Rep., 909.
²² Latremouille v. B. & R. R. Co., 22 Atl. Rep., 656.
²³ Kalemach v. M. C. R. Co. (Mich.), 49 N. W. Rep., 1082.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Flint & Pere Marquette, semi-annual, 2 per cent. on the preferred stock, payable Feb. 15.

Kansas City, Fort Scott & Memphis, annual, 8 per cent. on the preferred stock, payable Feb. 15.
New York, Chicago & St. Louis, annual, 3 per cent. on the first preferred stock, payable March 1.
New York, Providence & Boston, quarterly, 2½ per cent., payable Feb. 10.
Northern Central, semi-annual, 4 per cent.
Pittsburgh & Lake Erie, 3 per cent., payable Feb. 2.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Allegheny & Kinzua, annual, Olean, N. Y., Feb. 9.
Barclay, annual, 204 Walnut street, Philadelphia, Pa., Feb. 8.
Brooklyn Elevated, annual, adjourned, 31 Sands street, Brooklyn, N. Y., Feb. 20.
Camden & Atlantic, annual, Cooper Point, Camden, N. J., Feb. 25.
Chesapeake & Ohio, annual, Richmond, Va., Feb. 23.
Chicago Junction Railways & Union Stock Yards Co., special, New York, N. Y., March 1.
Chippewa Valley, annual, Mount Pleasant, Mich., Feb. 17.
Delaware, Lackawanna & Western, annual, 22 William street, New York City, Feb. 23.
Grand Rapids & Indiana, annual, Grand Rapids, Mich., March 2.
Kingston & Pembroke, annual, Kingston, Ont., Feb. 8.
Missouri Pacific, annual, St. Louis, Mo., March 8.
New York, Lackawanna & Western, annual, New York, N. Y., Feb. 23.
New York, Susquehanna & Western, annual, Jersey City, N. J., Feb. 25.
Northern Central, annual, Baltimore, Md., Feb. 25.
Philadelphia & Erie, annual, Philadelphia, Pa., Feb. 8.
Scioto Valley & New England, annual, Columbus, O., Feb. 11.
Southwestern (Georgia), annual, Third street, Macon, Ga., Feb. 11.
St. Louis, Iron Mountain & Southern, annual, St. Louis, Mo., March 8.
Summit Branch, annual, 231 South Fourth street, Philadelphia, Pa., Feb. 9.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *Railway Freight Claim Association of the Eastern, Western and Southern States* will hold its regular semi-annual meeting at the Grand Pacific Hotel, Chicago, Ill., March 3.
The *New England Railroad Club* holds regular meetings at the United States Hotel, Beach street, Boston, Mass., on the second Monday of each alternate month commencing January.
The *Western Railway Club* holds regular meetings on the third Tuesday in each month, except June, July and August, at the rooms of the Central Traffic Association in the Rookery Building, Chicago, at 2 p. m.
The *Southern Railway Club* holds regular meetings on the third Thursday of the months of January, February, March, May, September and November at such points as are selected at each meeting.
The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, the fourth Wednesday of January, March, May, September and November.
The *Northwest Railroad Club* meets on the first Saturday of each month, except June, July and August, in the St. Paul Union Station, at 7:30 p. m.
The *Northwestern Track and Bridge Association* meets on the Friday following the second Wednesday of March, June, September and December, at 2:30 p. m. in the directors' room of the St. Paul Union Station.
The *American Society of Civil Engineers* holds its regular meetings on the first and third Wednesday in each month, at the House of the Society, 127 East Twenty-third street, New York.

The *Boston Society of Civil Engineers* holds its regular meetings at the American House, Boston, at 7:30 p. m., on the third Wednesday in each month.

The *Western Society of Engineers* holds its regular meetings at 78 La Salle street, Chicago, at 8 p. m., on the first Wednesday in each month.

The *Engineers' Club of St. Louis* holds regular meetings in the club's room, Laclede Building, corner Fourth and Olive streets, St. Louis, on the first and third Wednesday in each month.

The *Engineers' Club of Philadelphia* holds regular meetings at the House of the Club, 1122 Girard street, Philadelphia, on the first and third Saturday of each month. The annual meeting is held on the third Saturday in January. The club stands adjourned during the months of July, August and September.

The *Engineers' Society of Western Pennsylvania* holds regular meetings on the third Tuesday in each month, at 7:30 p. m., at its rooms in the Thaw Mansion, Fifth street, Pittsburgh, Pa.

The *Engineers' Club of Cincinnati* holds its regular meetings at 8 p. m. on the third Thursday of each month in the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati.

The *Civil Engineers' Club of Cleveland* holds regular meetings on the second Tuesday of each month, at 8 p. m., in the Case Library Building, Cleveland. Semi-monthly meetings are held on the fourth Tuesday of the month.

The *Engineers' Club of Kansas City* meets in Room 200, Baird Building, Kansas City, Mo., on the second Monday in each month.

The *Engineering Association of the South* holds its monthly meetings on the second Thursday at 8 p. m. The association headquarters are at Nos. 63 and 64 Baxter Court, Nashville, Tenn.

The *Denver Society of Civil Engineers and Architects* holds regular meetings at 36 Jacobson Block, Denver, Col., on the second and fourth Tuesday of each month, at 8 o'clock p. m., except during June, July and August, when they are held on the second Tuesday only.

The *Civil Engineers' Society of St. Paul* meets at St. Paul, Minn., on the first Monday in each month.

The *Montana Society of Civil Engineers* meets at Helena, Mont., at 7:30 p. m., on the third Saturday in each month.

The *Civil Engineers' Association of Kansas* holds regular meetings at Wichita on the second Wednesday of each month at 7:30 p. m.

The *American Society of Swedish Engineers* holds meetings at the club house, 250 Union street, Brooklyn, N. Y., and at 347 North Ninth street, Philadelphia, on the first Saturday of each month.

The *Engineers' Club of Minneapolis* meets the first Thursday of each month in the Public Library Building, Minneapolis, Minn.

The *Canadian Society of Civil Engineers* holds regular meetings at its rooms, 112 Mansfield street, Mon-

tréal, P. Que., every alternate Thursday except during the months of June, July, August and September.

The *Association of Civil Engineers of Dallas* meets at 803 Commerce street, Dallas, Tex., on the first Friday of each month at 4 o'clock p. m.

The *Technical Society of the Pacific Coast* holds regular meetings at its rooms in the Academy of Sciences Building, 816 Market street, San Francisco, Cal., at 8 o'clock p. m. on the first Friday of each month.

The *Tacoma Society of Civil Engineers and Architects* holds regular meetings on the third Friday of each month, in its rooms, 201 and 202 Washington Building, Tacoma, Wash.

Central Railroad Club.

The annual meeting and dinner of the Central Railway Club was held in Buffalo, with a large attendance.

The meeting was called to order by President Eugene Chamberlain, who made some remarks extending a cordial welcome to the visitors and expressing his gratification at the large attendance.

Superintendent Morford, of the Michigan Central, on behalf of a committee representing the Buffalo Association of Railroad Superintendents, presented a communication from the local freight agents of the vicinity, asking for a modification of the present rules of interchange of cars requiring repairs, the object being to expedite the movement of freight at a minimum expense. Inspector Miller, of the Nickel Plate, had some comment to make on the education of car inspectors, which caused some amusement. But a discussion not meeting with favor, the matter was referred to a special committee.

The laid over subject of "Wheel Gauges and Defects" was brought up for further discussion.

Mr. Griffin, in view of the fact that the flanges of chilled wheels are now made thicker, believed the new gauge could be used with safety.

Mr. Mackenzie moved that the gauge recommended be sent to the Arbitration Committee of the Master Car Builders' Association. Mr. Adams was satisfied with the present gauge, unless it was true that the flanges were thicker, but did not believe that any reform would be affected. He wanted a uniform flange. Mr. Waitt said the Master Car Builders' Association had established a standard. Manager Bissell, of the Wagner Car Works, had found much difficulty from want of uniformity. Mr. Sewell thought the change in the radius of the gauge would cause more wheels to be condemned than under the present gauge.

After some further discussion and remarks by the President, Mr. Mackenzie's motion for reference was adopted.

The laid-over report on Brake Shoes was then taken up.

Mr. Adams said it was difficult to understand the real intent of the rule; there was great difference of opinion. He was not prepared to say at what points defects should be noted, and it was not safe to leave it to joint inspectors, as they never agreed. P. H. Griffin said there were two sides to the question, safety and expense, and, with diagrams showing brake efficiency at various rates of speed, read a paper on car wheels and brake service. In this he said that brake service was the severest hardship wheels were subjected to and produced two extreme effects, first, brake sliding, second, beating. The first renders the wheel unfit for service, but involves no immediate danger; only the expense of new wheels. The second develops heat in the tread and flanges, causing effects that may be followed by very serious consequences. . . . The use of cast iron for shoes is nearly universal, and it is the best material, owing to the importance of a homogeneous material, free from hard spots. The face of the shoe should conform exactly to the curve of the wheel, a consideration much neglected, many shoes being used directly from the foundry, where the necessary shape of the pattern or the use of old patterns, gives a shoe very different from the shape of the wheel, and it cannot be said what occurs in the wheel while grinding the shoes to conformity. Mr. Griffin very seriously objects to the use of shoes bearing on the tread near the flange and outer edge, and clearing the tread where it rests on the rail. He also dwells on the importance of having slack taken up, otherwise the travel of the piston may be used up before the brake acts.

Mr. Mackenzie said Rule 8 was not understood and caused much trouble, and was in favor of a general meeting of railroad clubs and Master Car Builders to prepare something definite to present at the next annual meeting of the Master Car Builders' Association. The President then announced the following subjects for the next meeting and the committees thereon:

A Uniform Charge for Labor for Repairs under Rules 6 and 8.

Steel Trucks for Freight Cars.

A committee named for the purpose made the following nominations, who were duly elected: President, Eugene Chamberlain; Vice-President, F. B. Griffith; Secretary and Treasurer, S. W. Spear; Assistant Secretaries, W. E. Corcoran and H. D. Vought.

Engineering Society of Western Pennsylvania.

The society gave a banquet at the Duquesne Club, Pittsburgh, the evening of Jan. 28. There were 163 members and guests at the table. Mr. William Metcalf, Past-President of the society, acted as toast master. There were 11 speakers and the speeches were unusually clever. The menu was printed on aluminum .001 in. thick.

E. P. I. Alumni Association.

The midwinter reunion was held at Cleveland, O., Feb. 2. A luncheon was served, after which the party visited some of the numerous important manufacturing establishments in the neighborhood of the city. The party dined at the Hollenden and spent the evening in social entertainments. On the 3d visits were made to other manufacturing establishments and points of general interest. At 8 o'clock in the evening an alumni meeting was held and a banquet at nine.

PERSONAL.

The Massachusetts Railroad Commissioners have chosen the new member, Hon. John E. Sanford, of Taunton, Chairman of the board.

Gen. R. N. Hood, President of the Knoxville & Augusta Railroad and of several banks and local companies at Knoxville, Tenn., died at Brunswick, Ga., Feb. 1.

Col. Theodore Cox, Secretary and Treasurer of the Little Miami Railroad, died on Tuesday last at his home in Cincinnati, from Bright's disease. Colonel Cox was born near Flatbush, L. I., and was 54 years old.

—President Timothy Blackstone, of the Chicago & Alton, it is said, has signified his intention of erecting at Brauford, Conn., a public library to cost \$125,000 in memory of his father, the late Capt. James Blackstone.

—Col. A. W. Wildes, of Skowhegan, has been renominated by Governor Burleigh, of Maine, to succeed himself on the Board of Railroad Commissioners. Colonel Wildes has served in this capacity for 31 consecutive years.

—Mr. Thomas Faulkner has been appointed Joint Immigrant Agent of the Trunk Line Clearing House, to succeed Mr. C. F. Doane, who resigned several months ago. Mr. Faulkner has general supervision for the railroads at Ellis Island, the new immigrant landing at New York.

—Mr. Edwin S. Riggs, of the firm of E. S. Greeley & Co. of New York, died at his home in Brooklyn last week, and was buried at New Haven, Ct., last Saturday. Mr. Riggs had been the manager of the railroad department of the firm for the last 12 years, and was also a Director and Assistant Treasurer of the company.

—Mr. Charles Hansel, Consulting Engineer of the Railroad and Warehouse Commission of Illinois, sailed from New York Feb. 3 to spend three months in Europe in investigating safety appliances, and especially signal systems. He has been commissioned by the World's Fair directors to arrange for exhibits at the fair by foreign railroads.

—Mr. William C. Tregge formerly a large iron manufacturer in Maryland, died at his home at Frederick, Md., Feb. 1, aged 77 years. He owned furnaces and forges in Columbia and Schuylkill counties, Pa., and in 1852 he removed to Baltimore, where he owned a large rolling mill. He built most of the earlier iron bridges on the Baltimore & Ohio.

—Mr. E. L. Moser has been appointed Mechanical Engineer of the Philadelphia & Reading in place of Samuel F. Prince, Jr., who recently resigned to take charge of the mechanical department of the Long Island. Mr. Moser has been in the mechanical department of the Reading road since 1883, and for the past year has been chief draftsman of the road.

—President John S. Wilson, of the Central New England & Western, retired from that office this week and was succeeded by President A. A. McLeod, of the Philadelphia & Reading, which has acquired the Poughkeepsie Bridge lines. Mr. Wilson has been President of the system since the railroad and bridge were opened for traffic. He was formerly General Freight Agent of the Pennsylvania.

—It is reported that Mr. John W. Sanborn, Superintendent of the Northern Division of the Boston & Maine, will probably receive the appointment of Acting General Manager of the Boston & Maine until the directors decide upon a successor to the late Mr. James T. Furber. The name of Mr. Payson Tucker, now General Manager of the Maine Central, is quoted in connection with that appointment.

—Mr. M. B. Cutter, General Superintendent of the Western Division of the Newport News & Mississippi Valley Co., has been appointed General Superintendent of the Louisville, New Orleans & Texas. Mr. Cutter has been connected with the Newport News Company since last April, when he succeeded Mr. John A. Frazier as General Superintendent. He was formerly Division Superintendent on the Northern Pacific.

—At the annual meeting of the Wheeling & Lake Erie this week President M. D. Woodford announced that it would be impossible for him longer to perform the duties of President of the company, because of the necessity of his giving his entire time to the affairs of the Cincinnati, Hamilton & Dayton. The Board of Directors then elected Mr. Frank R. Lawrence President.

—Mr. H. G. Krake has been appointed Assistant General Freight Agent of the Missouri Pacific, to succeed Mr. George MacLaine, who has recently resigned. Mr. Krake has been with the Missouri Pacific for about a year and a half as General Live Stock Agent. He was connected with the Atchison, Topeka & Santa Fe as agent at Trinidad, Colo., in 1883, as General Agent at Cincinnati in 1886 and as General Agent in Denver in 1890.

—Major W. F. Shellman, who has just been appointed General Manager of the Columbus Southern, was formerly General Traffic Manager of the Central of Georgia until last June, when the road was leased to the Georgia Pacific. Major Shellman has been General Freight Agent of the road for several years, until his appointment as General Traffic Manager in 1887. He has been engaged in real estate business in Atlanta since last October.

—Mr. Charles P. Shaw, who obtained considerable prominence through his promotion of the New York Cable Railway Co., died in New York City, Feb. 2. The cable company was organized by Mr. Shaw in 1884 to build 70 miles of cable road in New York City, but it became involved in considerable litigation and was defeated in the appeals made to the Supreme Court and the Court of Appeals. It is said that \$300,000 was spent in the organization and in subsequent litigation.

—Mr. Gaston Meslier, who has been appointed General Passenger and Ticket Agent of the Texas & Pacific, has held a similar office on the Missouri, Kansas & Texas for the last three years, or since that company was released from the Missouri Pacific system. Mr. Meslier was born in Mobile, Ala., and about 12 years ago was appointed Traveling Passenger Agent of the Wabash, and then was assistant to the General Passenger Agent of the Missouri Pacific until his transfer to the Missouri, Kansas & Texas.

—Last week the Boston Boot and Shoe Club gave a dinner to Mr. Joseph Hobson, Chief Engineer St. Clair Tunnel Co., and Chief Engineer Western Division Grand Trunk Railway. Whether they may have honored him as a man who had helped to establish and preserve a quick trade route between the Northeast and the Northwest, or whether they may have wanted especially to know what he had to say about tunnels in view of their rapid transit problem, does not appear. At any rate, they got from him a thorough and conscientious and excellent account of the construction of the St. Clair Tunnel.

—Mr. Richard P. Morgan has been known for a good many years to some of the readers of the Railroad Gazette. A few years ago he made a very exhaustive study of the Union Pacific and Central Pacific railroads and branches for the Pacific Railroad Commission. The purpose of this examination was to ascertain the present

actual value of the properties. He also conducted examinations of and made reports upon many of the railroad properties of the West for private parties. At one time he was one of the Railroad & Warehouse Commissioners of the State of Illinois. He announces that with his son, Mr. D. C. Morgan, he has established the firm of Richard P. Morgan & Son, and that the firm is prepared to make examinations of railroad properties. Mr. Morgan's address is Dwight, Ill.

ELECTIONS AND APPOINTMENTS.

Atchison, Topeka & Santa Fe.—H. C. Ives, formerly Assistant to the President, has been appointed Division Superintendent, as noted last week. He succeeds A. P. Tanner, Superintendent of the lines east of the Missouri River, and who has his headquarters in Chicago. Mr. Tanner has been transferred to the traffic department.

Brownstone & Middletown.—The incorporators of this company in Pennsylvania are: Allen Walton, Hummelstown, Pa., President; Robert J. Walton, Allen K. Walton and E. A. Penny, all of Hummelstown; W. J. Walton, H. O. Deshong and Morris Ebert, of Philadelphia.

Central New England & Western.—The annual meeting was held at 115 Broadway, New York, Feb. 3, at which the following Board of Directors was elected: A. A. McLeod, Howard Hancock, Thomas H. Richards, William R. Taylor, A. H. O'Brien, Albert Foster, Daniel Jones, F. G. Odenheimer, Arthur Brock, W. W. Gibbs, C. Tower, Jr., John W. Brock and Joseph F. Sinnott. The board organized by electing A. A. McLeod President; William A. Church, Treasurer; Daniel Jones, Auditor, and William R. Taylor, Secretary. All the officers are Reading representatives.

Chattanooga Southern.—The appointment of Newman Erb as Receiver has been confirmed. J. W. James, of Chattanooga, formerly President and General Manager, has been appointed General Superintendent.

Chattanooga Union.—At a recent meeting of the stockholders of the Belt Railroad an entire change of management was made. Capt. H. S. Chamberlain was chosen President, D. S. Anderson, Vice-President, and O. L. Hurlburt, Secretary and Treasurer.

Chicago, Rock Island & Pacific.—W. F. Evans has been appointed Assistant General Attorney of the lines west of the Missouri River.

Cleveland, Cincinnati, Chicago & St. Louis.—The office of Superintendent of Transportation will, it is stated, soon be created, and J. E. Rose, now Superintendent of the Cincinnati Division, will be appointed to the new office.

Columbus, Hocking Valley & Toledo.—The following directors were re-elected at the annual meeting in Columbus, O.: C. C. Waite, Charles B. Alexander, George N. McCook, Samuel D. Davis, Thomas F. Ryan, Charles B. Van Nostrand, Charles Foster, P. W. Huntington, James Kilbourne. The board elected the following officers: President, C. C. Waite; Vice-Presidents, Samuel D. Davis and C. B. Alexander; Secretary and Treasurer, W. N. Galt.

Columbus Southern.—W. F. Shellman has been appointed General Manager, with office at Columbus, Ga. He succeeds C. W. Chears, who resigns to become Assistant General Freight Agent of the Kansas City, Memphis & Birmingham.

Connecticut River.—George E. Frink has been appointed assistant treasurer of this company with office at Springfield, Mass.

Cumberland Valley & Martinsburg.—The annual meeting of the stockholders of the railroad was held at Martinsburg, W. Va., last Friday. Directors were elected as follows: Thomas B. Kennedy, Chauncey Ives, P. J. Boyd and Judge John Stewart, of Chambersburg, Pa.; J. E. Russell, Gorman Smith and E. W. Stone, of Winchester, Va.; F. Boyd Faulkner, George M. Bowers, M. T. Ingles and A. J. Thomas, of Martinsburg. The directors elected officers as follows: Thomas B. Kennedy, President; M. T. Ingles, Secretary; Joseph B. Russell, Treasurer.

Delaware.—At a special meeting of the Board of Directors, E. Tatnall Warner was elected President, to succeed the late Col. Christian Feibiger. William T. Porter was elected to fill the vacancy in the board.

Fitchburg.—J. W. Dodge, Superintendent of the Cheshire Division, having tendered his resignation, taking effect Jan. 31, Mr. C. L. Mayne, Superintendent of the Tunnel Division, has been given charge of that branch, his headquarters to continue at Fitchburg, Mass.

Georgia, Carolina & Northern.—J. M. Sherwood has been appointed Treasurer, with headquarters at Athens, Ga.

Hudson Tunnel Railway Co.—At the annual meeting of the stockholders of the company in New York City this week the old board of directors was re-elected. They are Charles Sooy Smith, Edward R. Greene, Richard O. Lorch, Frederick W. Rittler; William P. Moloney, Remsen G. Brooks and Otto Crouse.

Huntingdon & Broad Top Mountain.—The following officers were elected at the annual meeting of the company in Philadelphia this week: President, Spencer M. Janney; directors, James Long, James Whitaker, Thos. R. Patton, Jacob Naylor, William Bault, Samuel Bancroft, Jr., John Hopkins, George H. Colket, Robert H. Crozer, William H. Shallcross, Lewis A. Riley and Samuel Hellner.

Lancaster, Cecil & Southern.—The incorporators are Walter M. Franklin and Joseph M. Showalter, of Pennsylvania; I. Day Carter, Robert Mackey and William T. Warburton, of Cecil County, Md.

Little Miami.—The stockholders of the company met in Cincinnati Jan. 25, and re-elected the following Directors, to serve for three years: Briggs S. Cunningham, Thomas J. Emery, L. B. Harrison and John L. Whetstone. The Directors re-elected President Frank J. Jones and Vice-President Briggs S. Cunningham.

Long Island.—Samuel F. Prince, Jr., who has for a number of years been Mechanical Engineer of the Philadelphia & Reading, has resigned that position to take charge of the mechanical department of the Long Island railroad.

Louisville, New Orleans & Texas.—J. A. Ridgley has been appointed Acting Auditor, with office at Memphis, Tenn., and will have charge of the accounting depart-

ment until his successor is appointed to the late J. T. Penton.

Maine Central.—The auditing of freight accounts is now under the charge of W. W. Colby, the General Auditor of this company. His headquarters are at Portland, Me.

Massillon & Cleveland.—The stockholders elected the following board of directors this week: Charles W. Cass, Henry Amy and Charles Lanier, New York; John J. Haley, Pittsburgh; John Sherman, Mansfield, O.; P. G. Albright, Massillon, O.; L. B. Harrison and William Hooper, Cincinnati, and M. A. Hanna, Cleveland.

Mexican Central.—E. A. White, who has been for five years chief clerk in the General Freight and Passenger office, has been appointed Assistant General Passenger and Freight Agent, vice F. W. Dill resigned. His headquarters will be at the City of Mexico.

Minneapolis, St. Paul & Sault Ste. Marie.—John Collins has been appointed Roadmaster, with headquarters at Weyerhaeuser, Wis., vice E. Burke, transferred to other service.

Missouri Pacific.—H. G. Krake has been appointed Assistant General Freight Agent of the company and the St. Louis, Iron Mountain & Southern, in place of George MacLaine, resigned.

Montreal, Portland & Boston.—At a meeting of the stockholders of the railroad, last week, the following Directors were chosen: H. C. Fisk, St. Johns, Vt.; A. H. Gilmore, Stanbridge; A. B. Cross, F. W. Baldwin, F. E. Chamberlin, St. Albans, Vt.; T. B. Futvoye, St. Johns, and J. M. Greenshield, Montreal.

Newark, Somerset & Straitville.—The annual meeting was held at Newark, O., Jan. 27. The Directors were chosen as follows: W. W. Peabody, Cincinnati, O.; R. T. Devries, Wheeling, W. Va.; Orland Smith, Baltimore, Md.; J. H. Collins, Columbus, O.; M. Churchill, David Lee, Zanesville, O.; A. W. Dennis, Newark, O.; John Reed, Mansfield, O.; Frank Ames, Chicago, Ill. The Directors organized by choosing David Lee, President, and P. C. Sneed, of Chicago, Ill., Secretary and Treasurer.

New Orleans & Carrollton.—At the regular annual meeting, held recently, the following were elected Directors for the ensuing year: J. Hernandez, J. H. Menge, Charles E. Black, J. N. Avegno, Joseph Solari, William Devlin, John H. O'Connor, William U. Rosenthal, James De Buys. And at a meeting of the Board of Directors J. Hernandez was re-elected President and Walter V. Crouch Secretary.

New York Bay Extension.—The incorporators of this branch of the Long Island road are Austin Corbin, Benjamin Norton, George S. Edgell, William C. Wheeler, Everett R. Reynolds, Frank M. Kelly, William Kelly, D. S. Voorhees and James R. O. Sherwood.

New York, Texas & Mexican.—The annual meeting of the company was held in Victoria, Tex., Jan. 30, at which the following directors were elected: C. P. Huntington, J. Kruttschnitt, C. C. Gibbs, W. G. Van Vleck, D. C. Proctor, A. Da Costa and M. D. Monserrate. The officers elected were: J. Kruttschnitt, President; M. D. Monserrate, Vice-President; W. J. Craig, Treasurer; C. S. Wells, Secretary.

Norfolk, Wilmington & Charleston.—The following are the incorporators named in the Virginia charter just approved: R. E. B. Stewart, H. W. West, H. L. Smith, W. L. Dougherty, Thomas Pinckney, Thomas L. Huguenin, John C. Malonie, and others.

Ontario, Carbondale & Scranton.—The stockholders of the railroad held their annual election at Scranton, Pa., Jan. 28. The officers and Directors were chosen as follows: President, E. B. Sturges, of Scranton; Vice-President, J. E. Childs, of New York; Secretary and Treasurer, John Fleming, of New York; Directors, Thomas P. Fowler, J. E. Childs, John B. Kerr, of New York; J. E. Burr, C. E. Spencer, John Scurry, Edward Clarkson, of Carbondale; E. B. Sturges, W. W. Patterson, William H. Richmond, C. D. Simpson, O. S. Johnson, John Jermyn, of Scranton, Pa.

Ottawa, Starved Rock & Western.—The incorporators of this company, chartered in Kansas, are as follows: William L. Phillips, Charles F. Wilson, Charles S. Cullen, John O'Brien and Frederik V. Hobert, all of Ottawa, Ill.

Perry County.—These officers were elected by the company at a stockholders' meeting this week: President, C. H. Smiley; Directors, John Wistar, C. H. Smiley, Abram Bower, B. F. Junkin, C. A. Barnitz, John H. Sheibley, H. C. Shearer, S. W. Conn, William Orr, W. R. Johnson, James McIlhenny and W. F. H. Garber.

Piedmont & Cumberland.—The annual meeting of the stockholders of the railroad company was held at Baltimore, Md., Feb. 2. The following directors were re-elected: Henry G. Davis, Stephen B. Elkins, Arthur P. Gorman, W. H. Gorman, William J. Read, R. D. Barclay and George C. Wilkins, the last two representing the stock owned by the Pennsylvania Railroad Co. The directors re-elected Henry G. Davis President, T. B. Davis Vice-President, and E. W. S. Moore Secretary and Treasurer.

Richmond & Rappahannock.—The incorporators are Valentine Heckler, A. G. Babcock, Walter Sydnor, Thomas N. Carter, P. W. Lewis, John H. Allen, C. B. Jones, Henry W. Latane and others, of Virginia.

St. Joseph & Grand Island.—G. D. Berry has been appointed Purchasing Agent of this railroad and the Kansas City & Omaha.

Seaboard Air Line.—N. T. Cobb has been appointed Auditor of the Raleigh & Gaston, the Raleigh & Augusta, and the Durham & Northern, leased roads of this system. The appointment takes effect March 1.

Texas & Pacific.—Gaston Meslier has been appointed General Passenger and Ticket Agent of this company, vice B. W. McCullough, deceased. His headquarters will be at Dallas, Tex.

Union (Baltimore).—The stockholders last week re-elected the former Directors, with the exception of Henry James being elected to fill a vacancy. The Board organized by re-electing B. F. Newcomer, President; Frank Thomson, Vice-President; J. P. Kerr, Secretary, and J. S. Leib, Treasurer.

Union Pacific.—Charles J. Lane, Traveling Freight Agent, has been promoted to the office of Assistant General Freight Agent, with headquarters at Omaha, Neb.

Utica, Clinton & Binghamton.—The annual meeting of the stockholders was held at Rome, N. Y., last week.

The following directors were elected: George B. Phelps, R. S. Williams, John Thorn, James I. Scollard, W. M. Storrs, G. W. Adams, Frank D. Beebe, A. N. Sheldon, Allen Curtis, John W. Lippett, A. W. Reynolds, E. S. Williams, F. B. Woolworth. The directors organized by electing the following: President, James I. Scollard; Vice-President, George B. Phelps; Secretary and Treasurer, R. C. Williams.

Valley (Ohio).—Charles T. Manning, of the Baltimore & Ohio, has been appointed Engineer of Maintenance of Way of this road, with headquarters at Akron, O.

Wheeling & Lake Erie.—The stockholders at a meeting in New York, Feb. 2, voted to increase the number of directors from seven to nine. The old board was chosen for the ensuing year, and Frank H. Lawrence, of New York, and G. E. Pomeroy, of Toledo, were added to the board.

The new directory is as follows: M. D. Woodford, George W. Davis, S. C. Reynolds, George E. Pomeroy, Sidney Dillon, Frank R. Lawrence, John Greenough, John G. Warwick and E. K. Sibley. The Board of Directors has organized by the election of the following officers: President, Frank R. Lawrence; Vice-President, John F. Greenough; Secretary and Treasurer, James M. Ham. Chairman of Executive Committee, M. D. Woodford.

Wytheville Belt, Atlantic & Western.—The incorporators of this company in Virginia are: W. L. Yost, D. S. Pierce, James A. Parker, Robert Crockett, E. P. Parker, C. B. Thomas, William E. Fulton, R. E. Withers, Jr., C. W. Pike, S. W. Williams, and others.

RAILROAD CONSTRUCTION. Incorporations, Surveys, Etc.

Baltimore & Ohio.—The construction of the second track on the Metropolitan branch will probably begin within a few weeks near Kensington, Md. Contracts were recently let to C. D. Langhorne, of Richmond, Va., and Allen & Co., of Frederick, Md., but no actual work has yet been done.

Bangor & Piscataquis.—The Bangor & Aristook Railroad has made a new proposition to the city of Bangor, Me., for the lease of this road. The former company is willing to pay an amount equal to the net earnings of the line since the opening of the Dexter & Piscataquis branch of the Maine Central during the construction of the new road. After the completion of the Aristook road the company agrees to pay the full interest on the bonded debt of the Bangor & Piscataquis, thus relieving the city of any further liability for interest.

Birmingham & Jones' Valley.—The railroad, which is projected to extend from Birmingham via Avondale and Springville, to Gadsden, Ala., the terminus, filed a mortgage in Etowah County, Ala., last week, in favor of the Knickerbocker Trust Co., of New York, for \$1,000,000, for the purpose of constructing that railroad. The mortgage has been filed also in St. Clair and Jefferson counties, C. M. Bolden, of Pensacola, Fla., is President, and Charles B. Powell, of New York, Secretary.

Brownstone & Middletown.—The company was incorporated in Pennsylvania Feb. 1. The road proposed is to extend from Brownstone, on the line of the Lebanon Valley branch of the Philadelphia & Reading, about one mile east of Hummelstown, through Dauphin County to Waltonville, Pa., the length being 2½ miles. The capital stock is \$25,000.

Cambria & Clearfield.—Construction trains are now running between Kaylor and Brubaker Junction, Pa. The revision and improvement of the road between Cresson and Kaylor is nearly completed, and a portion of the new track has been laid. By April 1 the new track and the revised grades for the coal trains from the Upper Susquehanna will be completed from La Jose to Cresson. Upon the Susquehanna division of the road, which diverges from Chess Creek Junction to six miles north of Kaylor, the work is progressing rapidly. The heading on the tunnel near Carrolltown will be through by March.

Chicago, Fort Madison & Des Moines.—An engineering party left Fort Madison, Ia., last week under the charge of Chief Engineer E. F. Potter and Assistant Engineer Schnable, to make a survey for the proposed extension from Libertyville, Ia., the present terminus. The line will be run northwest to Ottumwa and will probably be continued from that point toward Des Moines.

Chicago, Rock Island & Pacific.—W. H. Craney, of the National Construction Co., of Natchez, Miss., reports that he has secured a contract for grading a considerable section of the extension south of Minco, through the Indian Territory, toward the Red River.

Chicago & Southeastern.—The road and property of the Midland (Indiana), between Anderson and Vandalia Junction, near Waveland, Ind., a distance of 79 miles, was transferred this week to the above company, which was recently incorporated. The road has not been operated since December. A mortgage has been issued to the Central Trust Co., of New York, for \$20,000 a mile. The new company proposes to better equip the road and to extend it.

Cleveland Belt & Terminal.—One of the officers is reported as stating that the company expected to push the construction of this line to completion very soon. The numerous delays in building the line have been caused, he says, principally by the failure to secure the right of way at certain points. Considerable progress has been made recently in this matter, although it will probably be necessary to condemn the right of way at several points. The line is to be built on the North and East sides of Cleveland, O., and will be about eight miles long, connecting with the Cleveland & Canton between Newburg and Broadway and with the Lake Shore & Michigan Southern.

Cloquet Lumber Co.—This company will build 10 miles of logging road from Cloquet, Minn., and will ultimately extend the road until it is 40 miles long.

Delaware & Hudson Canal Co.—J. Shanahan, of Tribes Hill, N. Y., who has the contract to rebuild the roadbed on the New York and Canada Division north of Crown Point, N. Y., has sublet part of the work to the Drake & Stratton Co., of 143 Liberty street, New York. The contract involves the construction of about 4,000 ft. of new road on the side of a hill, west of the present line. The work will involve the blasting of 30,000 yards of old rock, nearly all in a side cut.

Denver, Lakewood & Golden.—The negotiations that have been pending for the sale of the controlling

interest in this road to a syndicate of Denver capitalists in the interests of the Denver, Apex & Western are said to have been unsuccessful. The erection of the station on Arapahoe street in Denver, and the extension of the line from the city limits, through the streets of Denver, will be begun, it is reported, at an early day.

Denver & Rio Grande.—A survey is reported to have been started last week at Florence, Col., for a branch from that town along Eight Mile Creek to the mines at Cripple Creek. The line, if built, will probably be narrow gauge, and about 28 miles long.

Duluth, Mesabi & Northern.—The contractors, Donald Grant & Co. and Foley Bros. & Guthrie, of St. Paul, are asking for bids from sub-contractors for bridge and other work. The line is to be completed before Aug. 1.

Florida Roads.—The railroad of the Winston Lumber Co., which will furnish an outlet to the Land Pebble Phosphate and Bone Valley companies, is completed, excepting track laying, which is under way.

Geneva & Southwestern.—F. B. Merrill, of Canandaigua, N. Y., is reported by the local papers to have secured the charter and right of way of this partly graded road southwest of Geneva. It is proposed to complete the line to Stanley at the southern end of Lake Canandaigua, N. Y. The distance is about 20 miles, and most of this part of the road has been graded. The line will probably be continued a few miles further east of Lake Canandaigua to Blood's Station. If that project is carried out the road will form a connecting line between the New York Central & Hudson River and the Delaware, Lackawanna & Western.

Georgia, Carolina, & Northern.—The suit brought by the Georgia Railroad to prevent this company from using its right of way or disturbing its tracks from Hulseys station into the city of Atlanta was decided this week in favor of the former company. The new road has its track laid very nearly to Hulseys, at the city limits of Atlanta, and began to condemn the narrow strip of land belonging to the Georgia Railroad, which was not being used. An appeal will be taken from the recent decision, as the officers say that they can find no other way for an entrance to the city.

Great Northern.—Only a general idea has been given by the officers of the company of the route for the Pacific coast extension west of Kalispell, Mont. A local paper, however, has published a summary of the work west of that point, of which the following is an abstract: For 20 miles after leaving Kalispell the line runs through Smith's Valley, which is drained by Ashley Creek. At the Halverson camp there is still some heavy grading and rock work which will require 30 days to complete. The track is laid from Kalispell to within a few miles of this point. The grading is completed up Ashley Creek to Little Bitter Root Lake, on the divide between Smith and Pleasant valleys. At this point a 1,900 ft. tunnel has been built by Twoby Bros. From Halverson's to the tunnel is through heavy timber. From Pleasant Valley the line is graded to Island Lake, 16 miles. At Island Lake is Corey Brothers' headquarters, where 200 men are working on a difficult piece of grading. Down Fisher Creek to its junction with the Kootenay River, running through a narrow bottom, and down the Kootenay, 12 miles below, to Libby, the grading is completed. From Libby the line runs to Kootenay Falls, from which point to the Idaho line the grading is finished. Halverson, Richards & Co. are furnishing the ties. Porter Brothers, of Duluth, are the bridge contractors. Another section of 25 miles of the road has been sublet to Hugh Kirkendall, of Helena, Mont. The work commences near the mouth of Moses Coulee and extends along the east bank of the Columbia River to opposite the mouth of the Wenatchee. It does not include the bridge across the Columbia River, but the trestle work on this section is over 3,000,000 ft. The contract, it is estimated, will amount to about \$300,000. There is still a section between Moses Coulee and Spokane for which the sub-contract has not been let.

P. Larson, of Shepard, Henry & Co., contractors for the work west of the Cascade Mountains, says that about 150 men are employed on the corduroy road along the south fork of the Skykomish River, being built for the convenience of the contractors, from Sultan City to the base of the Cascade mountains. Of the 40 miles of road to be completed, about 25 miles has been built.

Iberia & Abbeville.—A subsidy asked by this company was voted at the election held in Abbeville, La., Jan. 25. The company agrees to have the line in operation from Abbeville west to New Iberia, a distance of 15 miles, during the summer. The line will probably be built and operated by the Southern Pacific, with which it will connect at Abbeville.

Indianapolis, Logansport & Chicago.—The special election ordered in Deer Creek Township, Logansport County, and Erwin Township, Howard County, to vote on the question of aiding the construction of the proposed railroad, was decided in the affirmative in both townships.

Kansas, Miami & Southern.—The charter of the company was filed in Kansas last week. It has a capital stock of \$200,000, and proposes to build a railroad from Columbus, Cherokee County, Kan., into the Indian Territory by way of the Miami Reservation. The office of the company will be at Columbus, Cherokee County, Kan.

Lake Shore & Michigan Southern.—The improvements of the road between Dunkirk and Angola, N. Y., are progressing rapidly and the construction trains of the Drake & Stratton Co., of New York, are very busy from Dunkirk east. The cut-off at Silver Creek is fast approaching completion. A trestle is being built across the bay, while the construction of a heavy retaining wall on the lake side is being pushed with the rest of the work.

Lancaster, Cecil & Southern.—The certificate of incorporation for this company was filed in Maryland this week. The company is the Maryland division of the Lancaster, Oxford & Southern, which is to be constructed from Lancaster southwest to a connection with the Baltimore & Ohio, a distance of 45 miles. The company just chartered is to be the section between Elkton, Md., on the Baltimore & Ohio, along Little Elk Creek and the Pennsylvania state line. It was the intention to make the terminus at Singery, but this has been abandoned.

Manioba & James' Bay.—This company has applied to the Dominion Parliament for a charter to build a road from Winnipeg, or from Eggle River, on the Canadian

Pacific, east of Winnipeg, thence northerly to a point on the Albany River at the head of the navigable waters of the river.

Massillon.—This company was incorporated in Ohio last week with a capital stock of \$110,000 to build a branch of the Cleveland & Canton. The line will be about 10 miles long, and will begin at Justus, at a point where the Cleveland & Canton and the Cleveland, Lorain & Wheeling roads cross, and will extend up the Pigcon Creek Valley through East Greenville to Dalton, on the Lake Erie & Western. The projectors are now negotiating for the right of way. The new line is to open up coal lands in Tuscarawas Valley at present inaccessible.

Mobile, Tuscaloosa & Florence.—The Commission appointed by the State of Alabama to have a survey made through the western part of the State from Florence to the Gulf of Mexico have organized a company under this name. As already reported, the preliminary surveys have been made by J. A. Milner, of Birmingham. The survey begins at Florence and extends through the most valuable coal fields in western Alabama and down the Warrior Valley to Linden and Mobile. The grades of this line will not exceed 40 ft. to the mile. The estimates are now being made by the chief engineer, and the Commissioners will then take definite action looking toward the construction of the road. When the appropriation was made it was not expected that the Commissioners could do more than to have surveys made and arrange then for the construction of the line by an independent company.

New Roads.—A railroad charter has been granted and the company organized to build a road from Jefferson to Athens, Ga. R. B. Russell is President.

The engineers who have been surveying the proposed new railroad from Green Spring Junction north to Westminster, Md., on the Western Maryland, finished their survey this week. Two routes were surveyed, both entering Westminster at about the same point. One route is three miles shorter than the other, but the grade is much heavier.

New York Bay Extension.—Articles of incorporation for this company were filed in New York this week by officers of the Long Island Railroad. The capital stock is \$600,000. It is proposed to build a branch to afford a shorter line to the summer resorts on the south shore of Long Island from points in New England, and is expected, in connection with the through line between Brooklyn and Boston, to develop a traffic between those points. Surveys are now being made from Garden City southwesterly to Flatlands, connecting the Oyster Bay Division with the Manhattan Beach road, crossing the South Shore Road near Valley Stream, and connecting with the Rockaway Beach and Long Beach branches. The new line will be constructed this year probably.

New York & New England.—The survey for the new line which is to connect the Woonsocket division of the road with its main line in Dorchester, near Boston, has now been completed and approved by the directors. As soon as the right of way is secured from the Newton, Brookline and Boston town authorities construction will be commenced. The road will be by the construction of the line save about \$50,000 annual rental now paid to the Boston & Albany for handling its Woonsocket division business.

New York & New Jersey Terminal.—The officers of this company state that they have secured the consent of practically a majority of the property holders along the route of its proposed tunnel in New York City, and that they expect to receive consents from several additional property holders this week. This is one of the many schemes for tunnels through New York City and under the East and North rivers. It is proposed to build a railroad tunnel from the Hackensack Meadows, passing under the Hudson River at a depth of 125 ft. from the surface to Fourteenth street, under Fourteenth street to Union Square, and under Fourteenth street, from Irving Place to the East River. The scheme also contemplates a line branching southward under Hudson street, on the west side, to Chambers street, and there continuing to a terminus under Broad street near Wall. The length of the four-track tunnel will be 3½ miles while that of the two-track tunnel will be 2½ miles. The total cost is estimated at \$16,500,000 for constructing the tunnels, stations and terminals.

Norfolk & Western.—Surveys have been made for several short branches to be built in Southwestern Virginia to the mines and coal lands of the Virginia & Tennessee Coal & Iron Co., near Abingdon, Va. It is expected that the construction will begin very soon on two branches of the Clinch Valley division, one up Russell Creek and the other up Big Toms Creek, averaging in distance about two miles each.

Orange & Keysville.—It being reported that a syndicate is being organized in order to complete the railroad to Keysville, Va. Efforts are being made to secure a six-months extension from the Board of Supervisors of Prince Edward County of the time for the completion of the road. In order to secure the bonds voted it.

Otis Elevating.—Reference has been made to this road, which is being built up the Catskill Mountains, and upon which work was begun several weeks ago. The company which is building the road is called the Otis Elevating Railway Co. The route is from a point on the Catskill Mountain Railroad near Palenville, Greene County, N. Y., and in a direct line up the face of the Catskill Mountain (North Mountain) to a point near the Mountain House, a distance of 7,000 ft. Contracts have been let as follows: Grading and masonry, Pennell & O'Hern; trestles, timber work and tracks, Mairs & Lewis; and machinery, Otis Bros. & Co. The line is an incline with grades varying from 4 to 33½ per cent; the line is straight with the exception of a turnout in the middle. There will be about 2,200 ft. of timber trestling, of a maximum height of 63 ft. The remainder of the work is rock excavation and fill. The road will be operated by cable, with power from a steam engine placed on top of the hill. There will be two cars, one attached to each end of cables, one car ascending while the other descends. Each car will seat 75 persons. The elevation between the two terminal points is 1,580 ft. The track will consist of three rails. The gauge is 3 ft. Charles Rickerson, 54 Harrison street, New York City, is President, and Thomas E. Brown, Jr., 33 Park Row, New York, is Chief Engineer.

Ottawa, Starved Rock & Western.—Articles of incorporation for this company were filed in Illinois last week, the capital stock being \$150,000. It is proposed to build a line about 10 miles long from Ottawa west to Starved Rock, a few miles east of La Salle, Ill.

Peninsular of Lower California.—The contractor for the line north of San Quinten, Lower California, reports much progress on the work there. An embankment of brown rock 20 ft. high and 1,420 ft. long has been filled in at the narrow part of San Quinten bay and the remaining 80 ft. will be bridged, 60,000 ft. of lumber having already been received for the purpose. When this is finished, ties and rails will be laid at once on the 14 miles of graded roadbed north of the Narrows. It is expected that work will soon be pushed rapidly toward the north toward San Diego, Cal., from San Quinten.

Pennsylvania & West Virginia.—Several of the sub-contractors have secured attachments against Col. Carroll T. Hobart, the principal contractor for this line, and the work has been suspended. One attachment is for \$10,000 and another is for \$25,000. It is proposed to build the road from Brooks Mills, Blair County, north to Cessna, in Bedford County, Pa.

Philadelphia & Reading Terminal.—The contract for completing another large section of the Reading's Philadelphia Terminal at Twelfth and Market streets, has been awarded to Charles McCall. His original contract was for only that portion of the train shed north of Filbert street, but under the contract just awarded he will complete the entire train shed, bringing it across Filbert street and to within about 100 ft. of Market street. Work on the new market is almost completed, and the demolition of the old buildings will soon commence. As soon as the foundations are laid the Pencil Iron Works will put up the iron and the Phoenix Bridge Co. will erect the great arches of the great roof of the train shed.

Pittsburgh, Cannonsburg & State Line.—Mr. R. W. Cotton, representing this company, has submitted to the City Council of Wellsburg, W. Va., a proposition for taking that road through the town along the river front. The company has secured nearly all the rights of way between Cannonsburg and Wellsburg.

Potomac Valley.—The construction work on this railroad, which is the Western Maryland extension to Cherry Run, W. Va., has been delayed by the non-arrival of an iron bridge for the crossing at Conococheague creek, near Williamsport. The bridge material will be forwarded in a few days, and it is then expected to push the work rapidly. The grading of the line, with few exceptions, has been completed. All the masonry work at the Potomac river is finished.

Puget Sound & Pacific Ocean.—The standard gauge road bought by this company from the Mason Central is now in operation for eight miles through Mason County, Washington. The right of way has been cleared for two miles additional, and is ready for the grading. The contract to complete this section will be let very soon, and the grading is to be finished before April 1. Surveys have been made and right of way secured for a 12-mile extension southwest to a connection with the new line of the Northern Pacific between Olympia and Aberdeen, Wash. The contracts for clearing and grading this section will be let in April, and it is proposed to begin the clearing and grading before April 15. There is no bonded indebtedness on the road at present, but a small issue will probably be authorized when the company begins to extend its line beyond the point already prepared for grading. Edward C. Perry, of Salt Lake City, is President of the company.

Quannah & Oklahoma.—The company has been chartered in Texas by James S. Clarkson, G. M. Dodge and others. It is stated that this road will be built from Fort Worth to Quannah, and thence across Greer County through Oklahoma Territory.

Richmond & Rappahannock Valley.—This company is applying for incorporation in Virginia to build a road commencing at Richmond, and extending to deep water on the Rappahannock River or the Chesapeake Bay. The line will extend through Henrico, Hanover, King William, King and Queen, Essex and other counties.

Roanoke Valley.—A bill has been introduced in the Virginia Legislature to incorporate this company to build a road from the city of Roanoke through the counties of Roanoke and Botetourt, to a point in Rockbridge County, Virginia. The incorporators are W. P. Huff, M. C. Thomas, C. A. Moomaw, R. H. Woodrum, and others.

Rochester & Honeoye Valley.—The grading has been completed on this road, which is being built as a branch of the new Lehigh Valley line, the Buffalo & Geneva, north from Rush City to the city of Rochester, N. Y. The track is being rapidly laid, and has been completed from the junction in East Rush north to the crossing of the West Shore Railroad at Red Creek, about four miles south of Rochester.

Salem.—Grading between the terminal points of this new Ohio road is now nearly entirely completed and the tracklaying will begin shortly. The length of the line is seven miles, extending from Salem on the Pittsburgh, Fort Wayne & Chicago, east to Washingtonville, Columbiana County, on the New York, Lake Erie & Western. Paige, Carey & Co. are the contractors for the grading and will probably also lay the track. The road was built by the sale of the Salem City bonds, and is owned by the city of Salem, O.; which has guaranteed payment of interest on the funds used in the construction of the road. The management of the road has been vested in a board of trustees consisting of B. S. Andler, President, Joel Short and J. M. Woodruff, who are appointed by the county court.

Santa Fe, Prescott & Phoenix.—The grading on the southern extension of this line, which has begun several months ago, near Phoenix, Arizona, has been completed for a distance of 16 miles north of that town, but no track has yet been laid. Contracts for the construction of the first 20 miles from Phoenix have been let to Redmond Tooley. A contract has recently been let to B. Lantry & Son, of Strong City, Kan., for building 57 miles on the north end of the road from Ash Fork, where it is proposed to connect with the Atlantic & Pacific. The length of the line between Ash Fork and Phoenix will be about 140 miles. Surveys have been made at each end of the line and are now being connected. The company expects to complete the line now being surveyed in a year and a half. The maximum grade will be 115 ft. to the mile and the maximum curvature will be 10 degrees on the mountainous section. Five truss bridges will be built and also several important trestles. The number and length of tunnels has not yet been decided, but probably it will be necessary to do a good deal of this work. D. B. Robinson, formerly General Manager of the Atlantic & Pacific, is President of the new road, and N. R. Gibson, of Phoenix, Ariz., is the Chief Engineer.

Southampton, Greenville & Brunswick.—This company has been chartered in Virginia to build a road

from a point on the Nottaway River in Southampton County, through the counties of Greenville and Brunswick, to a point on the Atlantic & Danville Railroad. The incorporators are E. C. Gates, Bradley L. Eaton, R. R. Sizer, R. H. Dobyns and J. P. Thomas.

Southern California.—The purchase by this company of the property and franchises of the Santa Monica Wharf & Terminal Co., is reported. The sale is said to include the transfer of 13 acres of land on a deep water harbor to the railroad, which will build a new road, starting from Inglewood on the Ballona branch, to be in operation in August.

Union Pacific.—The officers of the company in the East deny the recent reports that it is proposed to resume work early in the spring on the Portland & Puget Sound road, between Portland and Tacoma, Wash. The reports emanated, they think, from people in that section who are anxious to have the line built.

Wabash.—A mortgage was recorded last week in Indiana by the railroad company in favor of the Central Trust Co., of New York, for \$3,500,000. The mortgage was given to secure the money to be used in the construction of the extension from Montpelier to Chicago Junction. The mortgage is for 50 years, and the bonds will bear 5 per cent. interest. Heavy work on the road is being done this winter, and construction will be pushed rapidly as soon as the frost is out of the ground. It is expected to have the line completed this year. It will be about 150 miles long, the terminus being 20 miles east of Chicago at the junction with the Chicago & Western Indiana road, of which Wabash is one of the five owners. The Chicago & Erie lease expires June 30, 1892. The Wabash has paid an annual rental of \$60,000, and a share of the cost of maintenance and station service and cannot do a local business. The new road will entail a fixed charge of \$175,000 per annum, but it is believed that taking local business into account the road will earn materially more than its interest cost.

Washington & Chesapeake Beach.—It is expected that the engineers surveying the route of the proposed road to Chesapeake Bay will finish their work early in February. They have already reached Sunderlandville, Calvert County, which is not far from the terminus on the bay. The line, as located, begins south of Washington, D. C., near Benning's Station, on the Baltimore & Potomac Railroad, and extends southwest via Marlboro, the only curve being on the Patuxent River, near Mt. Calvert, Prince George's County. The road crossed the Patuxent River near Bristol at right angles. It will connect with the Baltimore line at Upper Marlboro and with the Washington Branch at Benning's.

West Memphis.—C. H. Organ, C. B. Bryan, C. W. Hunter and others, as directors, have incorporated this company to construct a railroad one and a half miles in length in West Memphis. The capital stock is \$10,000.

West Virginia & Pittsburgh.—It is stated that this company will make a change in its route between Weston and Clarksburg, W. Va., the new line to follow the river the entire distance, making the road a little longer but doing away with some very heavy grades that are necessary in the present line.

Winona & Southwestern.—There are a good many reports being circulated at present regarding the purchase by this company of the Mason City & Fort Dodge Railroad and concerning the route of the extension beyond Fort Dodge. There does not seem to be any evidence that any recent move has been made for the western extension. The road is now in operation to Osage, Ia. Recent letters from one of the officers say that the company expects to construct its line to the Missouri River at a very early day, but it is not certain that any construction work will be done this year. The route is still undecided and the terminus at the Missouri River may be either at Sioux City or Omaha.

Wisconsin Central.—The report that the right of way has been secured for an extension of the Marshfield branch to Beekman, Wis., seems to have been premature. The Marshfield branch is now in operation from Marshfield west 30 miles, and surveys have been made beyond that point, but not recently. The extension of the line to Beekman would shorten the main line to the west several miles over the present route via Abbotsford. No steps have yet been taken for the construction of the line, and there is only a possibility that it will be built some time in the future.

Wytheville Belt, Atlantic & Western.—A bill to incorporate this company is before the Virginia legislature. The line is to begin in Wythe or Smyth counties and extend through Rich Valley, Poor Valley or Walker's Creek Valley through Bland, Smyth, Tazewell, Buchanan or other western counties, and through Wythe, Grayson, Carroll, Floyd and Patrick counties.

GENERAL RAILROAD NEWS.

Atchison, Topeka & Santa Fe.—The gross earnings, operating expenses (exclusive of taxes and rentals) and net earnings of the railroad and auxiliary lines for the month of December, 1891, were as follows:

	Gross earn.	Oper. expen.	Net earn.	Oper. mile.
Roads owned and controlled.....	\$2,946,777	\$2,041,239	\$905,538	6,536
Roads jointly owned, Atchison's one-half.....	143,736	130,167	13,569	587
Total, Atchison system.....	\$3,090,513	\$2,171,406	\$919,107	7,123
<i>St. Louis & San Francisco:</i>				
Roads owned and controlled.....	\$939,184	\$345,104	\$594,080	1,329
Roads jointly owned, Frisco's one-half.....	141,158	125,427	15,731	536
Total, Frisco system.....	\$780,342	\$470,531	\$309,811	1,864
Aggregate, both systems.....	\$3,870,855	\$2,641,936	\$1,228,918	8,987

The following is a comparative statement for all lines:

	Gross Earn.	Net Earn.	Per Mile.	Mileage.
<i>Atchison System:</i>				
Dec., 1891.....	\$3,090,513	\$919,107	\$433.83	7,123
Dec., 1890.....	2,932,445	695,253	412.76	7,104
Inc.....	\$158,068	\$223,854	\$21.07	19
<i>St. Louis & San Francisco:</i>				
Dec., 1891.....	\$780,342	\$309,812	\$418.66	1,864
Dec., 1890.....	720,138	250,771	388.14	1,855
Inc.....	\$60,204	\$59,041	\$30.52	9
<i>Aggregate General System:</i>				
Dec., 1891.....	\$3,870,855	\$1,228,919	\$430.09	8,987
Dec., 1890.....	3,652,612	946,024	407.86	8,959
Inc.....	\$218,243	\$282,895	\$22.23	27

Atlanta & Florida.—An application for the appointment of a receiver was made in the Superior Court of Fulton County, Georgia, last week, on behalf of the bondholders, but the appointment has been deferred for a few days at the instance of the directors, who expect to arrange for funding the floating debt. The directors propose to issue second mortgage 30-year six per cent. bonds at the rate of \$4,000 per mile of road built, and if these are subscribed, to settle the company's indebtedness dollar for dollar. This new issue of bonds will make a total bonded indebtedness of \$12,000 per mile. If the reorganization is successfully carried out and the appointment of a receiver denied, it is proposed to extend the road south from Fort Valley, Ga.

Burlington & Missouri River.—A press dispatch states that the company has made an agreement with the Chicago, Rock Island & Pacific to run its trains from East Leavenworth over the bridge of that company, and into Leavenworth, Kan.

Canadian Pacific.—The company reports gross earnings for December of \$1,914,814, and net earnings of \$886,197, an increase of \$310,569 as compared with the same month of the previous year. For the year ending Dec. 31 the gross earnings were \$20,231,195, and net earnings \$8,013,000, an increase of \$1,559,194 as compared with 1890.

Carthage & Adirondack.—The New York Central & Hudson River road has purchased this road, extending from Carthage, N. Y., on the Rome, Watertown & Ogdensburg, northeast to the Benson Iron Mines, a distance of 47 miles. The terms of the sale are not given. The road has a large lumber traffic and reaches the valuable iron ore mines at Jayville and Benson. Its terminus is about 30 miles west of Tupper Lake, on the new Adirondack & St. Lawrence, and surveys have been made to connect the two lines.

Central of New Jersey.—The company reports gross earnings for December of \$1,155,407, a decrease of \$21,483, as compared with the same month of the previous year, and net earnings of \$507,572, an increase of \$5,700. For the year ending Dec. 31 the gross earnings were \$14,201,786, an increase of \$538,041 as compared with 1890, and net earnings \$6,091,817, an increase of \$184,791.

Chicago, Burlington & Quincy.—The earnings for December show a surplus of over half a million, being at the rate of about two-thirds of one per cent. on the capital stock. The figures for December are as follows:

	1891.	1890.	Inc. or dec.
Gross earnings.....	\$3,524,478	\$2,815,732	I. \$708,746
Oper. expen.....	2,216,054	1,738,501	I. 477,553
Net earnings.....	\$1,308,424	\$1,077,231	I. \$231,193
Fixed charges.....	800,000	775,516	I. 24,484
Surplus.....	\$508,424	\$301,715	I. \$206,709
<i>For the year 1891:</i>			
Gross earnings.....	\$35,352,275	\$35,130,586	I. \$221,689
Oper. expen.....	21,942,280	22,652,515	D. 710,235
Net earnings.....	\$13,409,995	\$12,478,071	I. \$931,924
Fixed charges.....	9,552,000	9,282,187	I. 269,813
Surplus.....	\$3,857,995	\$3,195,884	I. \$662,111

The company has authorized the issue of five per cent. bonds equal to 10 per cent. of the capital stock and convertible into stock. About \$4,000,000 of the bonds will be used for new equipment and the balance for terminals and other improvements.

Chicago, Milwaukee & St. Paul.—The earnings for the last six months of the year were the largest ever earned for that period. The company earned in the six months almost two-thirds of the interest on the fixed charges, taxes and the seven per cent. dividend on the preferred stock. It is expected that the directors will begin the payment of dividends on the common stock out of these earnings in the second half of the fiscal year. The figures for December follow:

	1891.	1890.	Inc. or dec.
Gross earnings.....	\$3,092,049	\$2,453,279	I. \$638,771
Op. exp. including taxes.....	1,719,551	1,497,075	I. 221,576
Net earnings.....	\$1,372,498	\$956,203	I. \$416,295
<i>Six months, July 1 to Dec. 31.</i>			
Gross earnings.....	\$17,553,034	\$15,193,420	I. \$2,359,614
Op. exp. including taxes.....	10,494,135	9,566,321	I. 927,814
Net earnings.....	\$7,058,900	\$5,627,099	I. \$1,431,801

Columbus, Hocking Valley & Toledo.—The annual report published this week gives the gross earnings for the last fiscal year as \$3,248,829; operating expenses, \$1,765,259; net earnings from operation, \$1,522,567; surplus over expenses, \$340,033; balance of surplus, \$96,476. As compared with the previous year, there was an increase of \$207,927 in the gross earnings; of \$88,027 in operating expenses, and of \$119,899 in net earnings.

Delaware, Lackawanna & Western.—The earnings for the year ending Dec. 31 were published this week, and show that the company earned the calendar year 1891 on the stock 9.21 per cent., against 10 per cent. in 1890, and 8.20 per cent. in 1889. The comparative figures follow:

	1891.	1890.	1889.
Gross earnings.....	\$41,849,754	\$40,303,344	\$38,247,621
Operating expenses.....	33,894,590	32,404,538	30,653,585
Net earnings.....	\$7,955,164	\$8,188,786	\$7,594,035
Interest and rentals.....	5,418,226	5,328,494	5,222,375
Balance.....	\$2,536,938	\$2,860,292	\$2,371,660
Depreciation.....	121,474	240,019	223,577
Balance.....	2,415,464	2,620,273	2,148,083
Dividends.....	1,834,000	1,834,000	1,834,000
Surplus.....	\$581,463	\$786,273	\$314,083
Coal transported.....	9,006,824	8,039,469	7,709,560

The company's floating obligations at the close of 1891 were \$7,971,712, of which \$4,443,558 have since been paid. The capital stock is \$20,200,000; bonded debt, \$3,667,000; surplus account Dec. 31, 1891, \$16,164,048.

Elizabeth, Lexington & Big Sandy.—The Chesapeake & Ohio gives notice that, having purchased from C. F. Huntington all his securities of this company, and having agreed to offer the same terms to other holders of like securities, it is prepared to receive such securities for exchange at the office of Drexel, Morgan & Co., New York, provided the securities are deposited before Feb. 30.

Grafton & Greenbrier.—The Baltimore & Ohio purchased this road at the foreclosure sale at Parkersburg, W. Va., Jan. 30, for \$250,000. The road has been operated for some time by that company, which owns nearly all the bonds. The line extends from Grafton southwest to Belington, W. Va., a distance of 42 miles, where a connection has recently been made with the West Virginia Central & Pittsburgh. It was built in 1884 as a narrow gauge line, but the work of changing it to standard gauge has been going on for some time.

Green Bay, Winona & St. Paul.—It is stated that the officers have decided to take up all the iron rails on the main line between Marshland and Green Bay, and on the branches. Over 125 miles are at present laid with iron rails, the balance of the road having 50 and 60-lb. steel rails.

Herkimer, Newport & Poland.—The New York State Railroad Commission has approved the application of the railroad company for an increase of capital stock from \$250,000 to \$500,000. It was shown that the cost of construction and equipment of the road to date was \$522,416; that the proposed increase is rendered necessary in order to pay the floating indebtedness of the company and to pay the contractors now under contract in the building the railroad; for further equipment; and to pay for further improvements in straightening the road, taking out curves and strengthening culverts and bridges, the estimated cost of which is \$100,000.

Louisville & Nashville.—The earnings for December are as follows:

	1891.	1890.	Inc. or dec.
Miles operated.....	2,906	2,248	I. 658
Gross earnings.....	\$1,791,151	\$1,651,839	I. 139,312
Oper. expen.....	1,185,256	1,025,830	I. 159,426
Net earnings.....	\$605,895	\$626,009	D. \$20,114
Six months ending Dec. 31:			
Gross earnings.....	\$11,061,173	\$10,031,375	I. 1,029,798
Oper. expen.....	7,048,707	6,240,606	I. 808,101
Net earnings.....	\$4,012,466	\$3,790,769	I. \$221,697

Lynchburg & Durham.—The directors are reported to have approved the lease of this road to the Norfolk & Western, at a meeting at Lynchburg, Va., last week. This lease was reported several weeks ago as having been concluded, but the officers of the Norfolk & Western then denied that such an arrangement had been concluded, but it may have been since arranged. The road was built in 1890 and 1891 from Lynchburg, Va., south to Durham, N. C., and is about 114 miles long.

Montana Union.—Papers were filed in the United States District Court, at Helena, Mont., Feb. 2, by the Northern Pacific to prevent the directors of the Montana Union from taking any action prejudicial to the interests of that company. At present the Northern Pacific and the Union Pacific have equal traffic advantages over the road, that line being owned by both companies. But the present arrangement will expire soon. The road has a heavy traffic from the mines and smelters at Butte and Anaconda, Mont.

New York Central & Hudson River.—The following statement shows the earnings of the company for the three months and the half year ending Dec. 31:

	1891.	1890.	Inc.
Gross earnings.....	\$12,265,630	\$9,462,456	\$2,803,174
Operating expenses.....	8,347,945	6,285,981	2,061,964
Per cent. expenses to earnings	68	66	
Net earnings.....	\$3,917,685	\$3,176,475	\$741,210
Fixed charges.....	2,465,446	2,114,400	351,046
Profit.....	\$1,452,239	\$1,062,075	\$390,164
Dividend.....	1,117,854	894,283	223,571
Surplus.....	\$334,385	\$167,792	\$166,593
Six Months to Dec. 31:			
Gross earnings.....	\$24,153,618	\$18,326,691	\$5,826,927
Operating expenses.....	16,004,916	12,523,504	3,481,414
Per cent. expenses to earnings	66	67	
Net earnings.....	\$8,148,702	\$5,803,187	\$2,345,515
Fixed charges.....	4,932,375	4,796,400	135,975
Profit.....	\$3,216,327	\$1,006,787	\$2,209,540
Dividend.....	2,334,707	1,788,596	546,111
Surplus.....	\$981,620	\$218,191	\$763,429

New York, Lake Erie & Western.—The following table gives the earnings for December and for the fiscal year to date:

	1891.	1890.	Inc.
Gross earnings.....	\$2,641,561	\$2,377,635	\$263,926
Operating expenses.....	1,836,008	1,668,739	167,269
Less—Proportions due to leased lines.....	242,725	239,189	3,536
Net earnings.....	\$562,828	\$478,706	\$84,122
Three Months, Oct. 1 to Dec. 31:			
Gross earnings.....	\$3,159,731	\$7,604,798	\$4,445,067
Operating expenses.....	5,487,312	5,036,942	450,370
Less—Proportions due to leased lines.....	72,712,419	\$2,567,856	\$144,563
Net earnings.....	\$1,905,477	\$1,867,717	\$37,760

Norfolk & Western.—The company has been making an experiment in the matter of making a market for its bonds in France. A block of the 100-year bonds was put into bonds of \$100 each, corresponding closely to a 500-franc issue; provision was made for the payment of interest in France and the bonds were offered in Paris. The move was successful and the bonds first offered were over subscribed to a considerable extent.

The following is a statement of the earnings of the road for the year 1891, including Scioto Valley and Maryland & Western (Shenandoah Valley) Divisions, and for purpose of comparison the earnings and expenses of these divisions have been included in figures for corresponding period previous year:

For 12 months Jan. 1 to Dec. 31:				
	1891.	1890.	Inc. or Dec.	
Average miles oper.....	1,091	1,091		60
Earnings from:				
Pass., mail and express.....	\$2,067,725	\$1,137,723	D.	\$930,002
Freight.....	7,090,316	6,439,301	I.	650,925
Gross earnings.....	\$9,188,042	\$8,577,114	I.	\$610,928
Expenses, including tax.....	\$6,002,767	\$5,067,082	I.	\$935,685
Net earnings.....	\$3,178,274	\$2,910,032	I.	\$268,242
P. c. of expenses to gross earnings.....	65	66		

Pennsylvania.—The statement of the business of the lines east of Pittsburgh and Erie for December shows a handsome gain in the gross earnings, but an unusually heavy increase in operating expenses caused a decrease in the net of \$33,402, compared with the previous year. For the year to date, however, there was a net increase of \$257,691. The figures for December, 1891, follow:

	1891.	1890.	Inc. or dec.
Gross earnings.....	\$5,796,829	\$5,303,319	I. \$493,510
Operating expenses.....	4,294,130	3,708,208	I. 585,922
Net earnings.....	\$1,502,699	\$1,595,111	D. \$92,412

Year to Dec. 31:			
Gross earnings	\$66,428,841	\$66,262,269	I. 166,572
Operating expenses	45,947,444	41,980,554	I. 3,966,890

Net.....\$20,481,397 \$24,281,845 I. \$3,800,448
All lines west of Pittsburgh and Erie for December, 1891, as compared with the same month in 1890, show a decrease in gross earnings of \$163,087, an increase in expenses of \$202,087, and a decrease in net earnings of \$455,774. The year 1891 as compared with 1890 shows a decrease in gross earnings of \$1,003,045, a decrease in expenses of \$1,357,130, and an increase in net earnings of \$353,491.

Union Pacific.—It is stated that the city of Omaha, Neb., is about to sue the company to recover property deeded to the corporation in 1883, which is valued at \$1,500,000. Part of the property lies along the river front, and the remainder consists of lots in the wholesale business part of the town.

Wheeling & Lake Erie.—The arrangements for the use by this company of the tracks and approaches of the Wheeling Bridge & Terminal Co., including the bridge over the Ohio River at Wheeling and the new union station, were perfected last week, and the first through train between Wheeling and Cleveland was run Feb. 1.

TRAFFIC.

Chicago Traffic Matters.

CHICAGO, Feb. 3, 1892.
As a result of the action of the Michigan Central in refusing to honor the tickets issued by the "Soo" line reading over the line of the former, the latter announces a cut in the rate from St. Paul to Detroit from \$16 to \$12.50, and in the same ratio on all New England points and New York. It is not likely that the St. Paul-Chicago lines will meet this cut. Ever since the "Soo" line became a factor in passenger rates there has been more or less trouble between it and the St. Paul-Chicago lines, and numerous conferences have been had in a vain endeavor to agree upon rates which would allow the latter to participate in the business. The Duluth, South Shore & Atlantic and the Minneapolis, St. Paul and Ste. Marie made through rates over the Grand Rapids & Indiana and Michigan Central which cut the rates via Chicago. The latter roads protested, and the South Shore agreed to cancel the rates. The "Soo" line declined to do so, and was consequently cut off on Jan. 30.

The Kansas lines have held several meetings in the past week to consider what action they would take in regard to the proposed tariff on fifth class freight from Missouri River points westward, ordered by the Kansas Railroad Commissioners, effective Feb. 1. The tariff effects a reduction of about 20 per cent. on fifth class freight. The meeting adjourned without taking concerted action, some of the roads preferring to wait until the Commission was appealed to for a rehearing. The Commission in response to such an appeal has now announced a rehearing for Feb. 8.

The Commissioners of the Western Traffic Association have authorized the establishment of a rate of 77½ cents per 100 lbs. on mining machinery, chloride of lime, crude sulphur and sulphuric acid, carloads, Chicago to Central City, S. Dak.

Chairman Finley has notified members of the Western Passenger Association that as there is nothing specific in the recent ruling of the Arbitrators as to the amount of excess commissions being paid on transcontinental immigrant business, what routes are paying them, or what relief shall be granted to association lines, he has no alternative but to adopt extreme measures to secure equality. He accordingly authorizes such commissions as may be necessary to meet actual competition on seaboard immigrant traffic to California points, subject to such further disposition as he may hereafter make.

The joint committee of the Central Traffic and Trunk Line Associations have authorized a rate of 25 cents per 100 lbs. eastbound, Chicago to New York, on binding twine, flax in bales, O. R. fire and water, hemp in bales, O. R. fire and water, jute or jute lasses, manilla or sisal.

The Freight Committee of the Central Traffic Association authorized a commodity rate of 6th class on rags and paper stock (waste and scrap paper) in bales, machine compressed, carloads, between all association points.

Chairman Blanchard, of the Central Traffic Association has issued a circular letter in regard to supplies to be sent forward for Russian relief, in which he says the contributions will be limited to flour, corn and corn meal. The quantities of which he is thus far advised as going forward are approximately 100 cars shelled corn from Iowa, about five car loads from Indiana, with more considerable shipment from the Northwest, the amount of which is not yet stated.

St. Louis lines are endeavoring to obtain a differential on passenger business between Kansas City and Buffalo as against lines via Chicago.

The Eastern lines are now exchanging business with the Alton, and all traces of the late unpleasantness are fast disappearing.

Traffic Notes.

Passenger fares between Memphis and New York City were reduced this week to \$12.50.

Two Pullman conductors have been on trial at Shreveport, La., for violating the law requiring accommodations for black passengers separate from those for whites. The conductors have been convicted in one trial, but the suit is being made a test case.

The Southern Pacific has given notice in the Transcontinental Association of its withdrawal from the commission agreement, and Chairman Vining has ruled that it is in violation of the agreement and forbids other lines from paying excessive commissions to meet this competition.

The Illinois Central is getting up an excursion from St. Paul and other Western cities to Havana, Cuba, with a view to increasing the shipments of flour to Cuba. It is said that 50 to 100 millers will go on the excursion, starting Feb. 26. The duty on flour imported into Cuba has been reduced from \$5.33 per 200 lbs. to \$1.

The Western New York Car Service Association has taken in the Philadelphia & Erie road, and all stations between Buffalo and Brockton on the Lake Shore & Michigan Southern, the New York, Chicago & St. Louis, and the Western New York & Pennsylvania. The Alabama Car Service Association has taken in 11 important towns not heretofore covered.

The following statement shows the number of cars of freight shipped east from Kansas City during 1891, and the proportion taken by each road: Atchison, Topeka & Santa Fe, 30,924 cars; Burlington, 22,139; Chicago & Alton, 18,827; Missouri Pacific, 15,713; Kansas City, Fort Scott & Memphis, 14,568; Rock Island, 13,880; Wabash,

10,965; Chicago, Milwaukee & St. Paul, 10,671; Chicago, St. Paul & Kansas City, 8,037. This makes a total of 145,746 cars.

The manufacturer who does not ship his product by the train load, in elaborately ornamented cars, is now sadly behind the times. The latest exploit in this line is a solid train of 17 carloads of soap from Denver to Fort Worth. Forty-eight cars of "Sunbeam cultivators" from Springfield, O., have just passed through St. Louis on their way to Kansas City and Little Rock.

A discussion of the free pass evil in Massachusetts has led to the presentation of a bill in the Legislature, giving members of that body \$2 mileage each way to cover the whole of a yearly session. This would permit the members living from 75 to 100 miles away from the capital to go to and from their homes daily throughout an ordinary session. The provision of the new Kentucky constitution prohibiting passes has caused much discussion in that state, and members of the legislature have tried to formulate resolutions that would enable them to get around the law more or less completely.

Chairman Smith, of the Trans-Missouri Passenger Association, recently fined the Burlington \$100 for holding a regular train to accommodate a theatrical party, claiming the holding of the train was a violation of the agreement in practically making a "special" train of it. The complaint was entered by the Missouri Pacific, which claims that it could have taken the party on a later regular train had not the Burlington held its train. The Burlington in defense claims a contract by which it would have taken the party anyway and would have been obliged to run a special unless they had held the regular train. It will probably appeal from the decision and make a test case of it.

Some of the New York reporters have pried into the passenger affairs of the Trunk Lines and claim to find that there is a good deal of difficulty in adjusting the percentages of westbound traffic over the different roads. It appears that a division of first and second-class passengers has been agreed upon, with the proviso that inequalities shall be evened up by the diversion of emigrant passengers. It is said that the New York Central gets from two to seven per cent. more high-class passengers than are allotted to it, and that there are not enough emigrants to make the desired adjustment, a large proportion of them being secured by unauthorized agents for the weaker roads, the business thus not coming into the allotment. The percentage agreement is said to be as below. It is understood to include business to and beyond Western termini of trunk lines:

New York Central.....	33
West Shore.....	6
New York, Ontario & Western.....	3
New York, Lake Erie & Western.....	13
D. L. & W.....	3.5
Lehigh Valley.....	5
Pennsylvania.....	25
Baltimore & Ohio.....	9.5
Total.....	100

Washington Lumber Business.

Mr. A. H. Anderson, one of the principal owners of the Washington Southern railroad, the largest logging road on Puget Sound, says, in an interview in *The Timberman*, that the eight-cent reduction in rates on lumber from Washington mill points to the Mississippi river, will not probably improve trade with eastern points much, as it is not great enough. He does regard as important, however, the concession made recently by the Eastern traffic associations, whereby long stuff to the length of 100 ft. will be transported across the continent. Continuing he said: "This eight-cent reduction will help shingles, as it will allow them to be transported to the Mississippi River for 47 cents, where it cost 55 cents before. For lumber, however, the maximum will have to be 35 cents to allow us to compete with the Southern States and Minnesota, Wisconsin and Michigan. Even if the rates were down to 35 cents we could not ship anything but the higher grades of long stuff, and any road would have to have a special equipment, mostly flat cars, which would be returned empty."

There has been a great deal of talk about the benefit the Nicaragua canal will be to the lumber trade on this coast, but I do not see how it can be developed much if present conditions prevail. Lumber is the cheapest and coarsest freight that goes out of the sound. Towing now costs, from Cape Flattery to the mills and back to the ocean, from 6 to 10 per cent. of the gross value of the cargo. As I understand it, it will cost fully 15 per cent. to tow through the proposed canal and a ship can better afford to go around the Horn, equipped with cheap sailors, than to pay such an enormous tow. I was told in Tacoma that the whaleback would load a return cargo of lumber at the St. Paul Lumber Company's wharf, and I shall watch this voyage with a good deal of interest, because the whaleback consumes very little fuel, and she can save not only the towing charges incident to Puget Sound, but also at the end of the voyage, so I look upon the development of the whaleback and the construction of the canal as contemporaneous incidents in the development of the lumber trade of the country."

Eastbound Freight Shipments.

The shipments of eastbound freight from Chicago by all the lines for the week ending Jan. 30 amounted to 96,812 tons, against 105,486 tons during the preceding week, a decrease of 8,674 tons, and against 77,344 tons during the corresponding week of 1891, an increase of 19,468 tons. This includes flour, grain and lumber. The proportions carried by each road were:

Roads.	Wk. to Jan. 30.		Wk. to Jan. 23.	
	Tons.	P. c.	Tons.	P. c.
Michigan Central.....	15,406	15.9	17,092	16.7
Wabash.....	7,435	7.7	6,602	6.2
Lake Shore & Michigan South.....	15,583	16.1	18,957	18.0
Pitts., Ft. Wayne & Chicago.....	14,592	15.1	11,785	11.2
Pitts., Cin., Chicago & St. L.....	9,491	9.8	11,806	11.2
Baltimore & Ohio.....	9,721	10.0	8,716	8.3
Chicago & Grand Trunk.....	7,455	7.7	10,725	10.2
New York, Chic. & St. Louis.....	8,083	8.0	9,044	8.5
Chicago & Erie.....	8,436	8.7	10,230	9.7
Total.....	96,812	100.0	105,486	100.0

Of the above shipments 9,365 tons were flour, 53,263 tons grain, 3,236 tons millstuffs, 6,646 tons cured meats, 9,533 tons dressed beef, 1,544 tons hides and 3,088 tons lumber. The three Vanderbilt lines carried 41 per cent. of all the business, and the two Pennsylvania lines carried but 24.9 per cent.

GEO. WESTINGHOUSE, JR.,
President.T. W. WELSH,
Supt.JOHN CALDWELL,
Treasurer.W. W. CARD,
Secretary.H. H. WESTINGHOUSE,
General Manager.

THE WESTINGHOUSE AIR BRAKE COMPANY

PITTSBURGH, PA., U. S. A.,

MANUFACTURERS OF THE

WESTINGHOUSE AUTOMATIC BRAKE

The WESTINGHOUSE AUTOMATIC BRAKE is now in use on 22,000 engines and 270,000 cars. This includes (with plain brakes) 180,000 freight cars, which is about 18 PER CENT. of the Entire Freight Car Equipment of this country, and about 80 per cent. of these are engaged in interstate traffic, affording an opportunity of controlling the speed of trains by their use on railways over which they may pass. Orders have been received for 120,000 of the Improved Quick-Action Brakes since December, 1887.

The best results are obtained in freight train braking from having all the cars in a train fitted with power brakes, but several years' experience has proven conclusively that brakes can be successfully and profitably used on freight trains where but a portion of the cars are so equipped. Below is a graphical illustration of the progress made in the application of the Automatic Brake to freight cars since its inception.

Year.	No. per year.		Grand total.
1881	105		105
1882	1,085		1,190
1883	4,966		6,156
1884	15,051		21,207
1885	10,410		31,617
1886	8,946		40,563
1887	9,281		49,844
1888	27,696		77,540
1889	26,065		103,605
1890	50,502		154,107

154,107 freight cars fitted with the Westinghouse Automatic Brake, which is more than 15 per cent. of the Entire Freight Car Equipment of this country.

E. L. ADREON, Manager.

JOHN B. GRAY, Agent.

C. C. HIGHAM, General Supt.

THE AMERICAN BRAKE COMPANY.

NEW YORK OFFICE,
160 Broadway, JOHN B. GRAY, Agent.

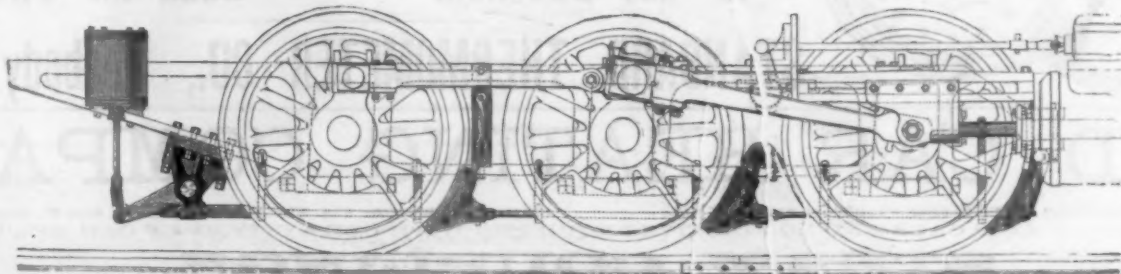
THE WESTINGHOUSE AIR BRAKE CO., Lessee,

CHICAGO OFFICE,
GRAND PACIFIC HOTEL.

MANUFACTURERS OF

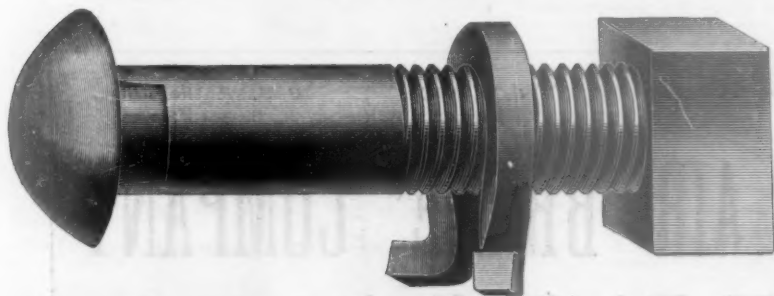
LOCOMOTIVE BRAKES.

General Offices and Shops, Second and Tyler Sts., ST. LOUIS, MO., U. S. A.



Standard Outside Equalized Pressure Brake, for two or more pairs of Drivers, furnished to operate with either STEAM, AIR or VACUUM

THE "STANDARD" NUT LOCK



Manufactured under D. O. Ward's Patents by the
STANDARD NUT LOCK CO.,
 NOS. 236-248 BANK ST., NEWARK, N. J.
 SAMPLES FREE.

This nut lock is presented on its merits as the best and cheapest device for securing track joints.

It is a torsional loop made of good quality of tempered spring steel, having horizontally inclined foot pieces, which are curved inward, thereby greatly increasing the spring resistance and acting simultaneously; rests upon the base of angle bar, or underlying rail base in case of fish plate, preventing the loop portion from rotating and hammering down thread of bolt.

The nut lock for $\frac{1}{4}$ bolt made of $\frac{1}{4}$ in. square steel, standard pattern, yields a tension of 4,300 lbs. on the bolt, which is sufficient to reduce the wear of the bearing surfaces of the angle bars on the rails, imparting, as it does, a uniform bearing the entire length of the bar.

The "Standard" Nut Lock has sufficient elasticity to maintain a tight joint, which cannot be truthfully said of many light-weight single coil washers.

The "Standard" Nut Lock is, in its superficial form, similar to an annular coil twisted out of plain, i. e., the curved shoulders or ends of the loop proper are spread in the usual manner of spring coils, at which bearing points the locking friction is equal to that of the best single coil washer, and added to this it is terminated in *asymmetrically* curved extensions, which must apparently furnish additional short leverage spring force of a torsional character.

Distinctive Merits of the "Standard" Nut Lock, Condensed:

Fixedness of position—cannot rotate and hammer down threads of bolt.

Cannot get one end into elongated slot of angle-bar.

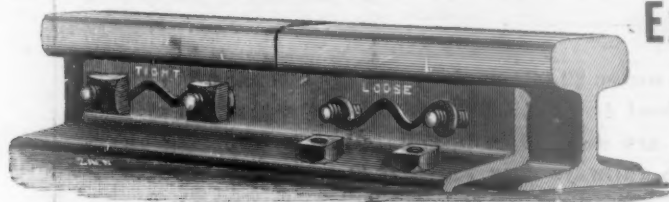
Unlike any permanently placed, double washer, the Standard is interchangeable regardless of distance between bolts.

Cannot be put on wrong side out, as the outward projection of the foot pieces would prevent the nut being turned up.

Has more spring power directly under the nut than any two ordinary coil nut locks.

Being fixed in position, it offers double the locking friction of nut locks, which when in their "dead" condition turn back with nut by the vibrative effect of passing train.

The "Standard" Nut Lock embodies the old principle of spring power improved by overcoming the objection to the double washer or nut lock, and covering the weak points of the single coil washer.



Excelsior Automatic Nut-Lock and Fish Plate Spring

These Nut Locks have been adopted by the New England Road-Masters, in Conventions held at Hartford, Conn., Oct. 19 and 20, 1887, and Boston, Mass., Aug. 15 and 16, 1888, as the best Nut Locks known.

Sample lots furnished for trial, free of expense, by forwarding the distance between centres of fish-plate bolts. Correspondence and orders solicited.

RUFFNER & DUNN,

Patentees and Sole Mfrs., SCHUYLKILL FALLS, Philadelphia, Pa.



Simple.

Easily

Applied.

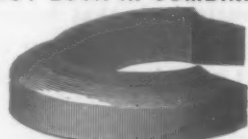
Very

Effective.

THE NATIONAL LOCK WASHER

THE ONLY POSITIVE NUT LOCK IN COMBINATION WITH ELASTICITY.

Sixty Millions in Use in
 Railroad Track.



For Use on All Kinds and
 Classes of Work.

THE NATIONAL LOCK WASHER CO., Newark, N. J.

Made for all
 sizes of bolts.

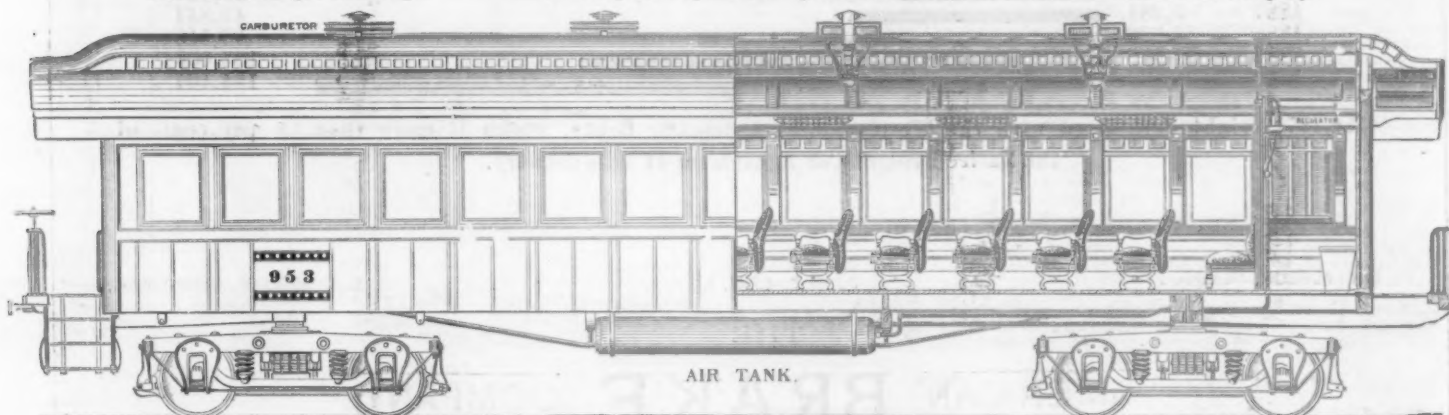
A trial is re-
 quested.

Samples free of
 expense.

THE FROST DRY CARBURETOR SYSTEM OF CAR LIGHTING.

The Greatest Light of the Age.

Extensively Used by the Pennsylvania Railroad and the Pullman Palace Car Company.

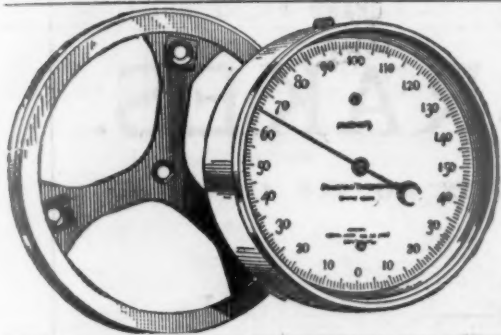


GENERAL ARRANGEMENT OF PARTS OF LIGHTING SYSTEM ON CAR

It cannot fail to attract the attention of practical railroad managers on account of its absolute safety, durability, simplicity, efficiency and its great economy. Each amp gives 100 candle-power illumination. One hundred hours' continuous service from one charging of the carburetor.

THE RAILROAD LIGHTING & MFG. COMPANY.

Office, 700 and 701 Girard Building, Philadelphia, Pa., U. S. A.



THE STANDARD THERMOMETER

HAS BEEN ADOPTED BY THE

PENNSYLVANIA, BOSTON & ALBANY, FITCHBURG,
 and numerous other roads.

Is not Excelled.

Send for Circular.

STANDARD THERMOMETER CO., Peabody, Mass.

GOLD CAR HEATING COMPANY

NEW YORK ADDRESS: N. E. Corner Frankfort and Chiff Sts.

CHICAGO OFFICE: 653 The Hookery, E. H. GOLD, Representative.

UPWARD OF 4,000 CARS AND LOCOMOTIVES EQUIPPED WITH OUR SYSTEMS OF CAR HEATING.

STEAM COUPLINGS.

Gold's INTERCHANGEABLE, with Gravity Relief Trap.

UNIVERSAL,

WESTINGHOUSE TYPE,

to couple with SEWEL,

GIBBS.

We own the Sole Rights under United States Patents to put Traps on Steam Couplings.

Send for Catalogue, etc.

A. W. SOPER, President.

ROBT ANDREWS, Vice-President.

R. M. DIXON, Engineer.

C. L. GATELY, Secretary.

W. R. THOMAS, Treasurer.

The Safety

THE HEATING SYSTEMS.

BY HOT WATER CIRCULATION AND DIRECT STEAM WITH
REGULATING DEVICES.
RELIABLE AND UNIFORM HEAT.
ECONOMICAL AND RAPID CIRCULATION.
GIBBS' AUTOMATIC COUPLER OF WESTINGHOUSE TYPE,
ABSOLUTELY STEAM TIGHT.

Car Heating and Lighting Co.,

160 BROADWAY, NEW YORK.

THE LIGHTING SYSTEM.

THE CELEBRATED PINTSCH COMPRESSED OIL GAS METHOD
IN USE ON OVER 40,000 CARS IN EUROPE AND AMERICA.
THE BEST, MOST ECONOMICAL AND ONLY SAFE LIGHT FOR RAILROAD PURPOSES.
IN BRILLIANCY AND CLEANLINESS UNSURPASSED.
THIS SYSTEM HAS BEEN ADOPTED BY THE U. S. LIGHT-HOUSE BOARD FOR LIGHTING BUOYS.

WM. MARTIN, President.

FRANK E. SHAW, Vice-President and Treasurer.

W. E. CANDEE, Secretary.

THE MARTIN ANTI-FIRE CAR HEATER

NOW IN USE ON MORE THAN 3,500 CARS AND ENGINES.

ADOPTED ON

Boston & Albany Railroad,
New York Central & Hudson River
Lake Shore & Michigan Southern,
Michigan Central,
Cleve., Col., Cin. & Ind. "Bee Line,

Kings County Elevated,
Dunkirk, Allegheny Valley & Pittsburgh.
New York, Susquehanna & Western,
Cleveland & Canton,
West Shore,

Fall Brook Coal Co.,
Beech Creek Railroad,
Detroit, Lansing & Northern,
North. Cent. Div. of Pennsylvania System,
Union Pacific,

Buffalo, Rochester & Pittsburgh,
Providence & Worcester,
Long Island Railroad,
Elmira, Cortland & Northern R. R. Co.
Lehigh Valley,

AND IN USE ON MANY OTHER RAILROADS.

MANUFACTURERS OF

Martin's Combination Car Heater, DeKalb Ventilating Car Window, Automatic Car Light Extinguisher,
Automatic Steam Trap, Reducing Pressure and other Valves Especially
Adapted to Steam Car Heating.

WHOLESALE DEALERS IN BRASS AND IRON STEAM FITTINGS, STEEL AND WROUGHT IRON PIPE

MARTIN ANTI-FIRE CAR HEATER CO., DUNKIRK, N. Y.

ALBANY, N. Y.

TRINITY PLACE.
New York City,
115 BROADWAY.

STEAM COUPLERS

AND
FIRE PROOF
HEATERS.

CONSOLIDATED

McElroy, Sewall, Westinghouse and other Patents.

CATALOGUES UPON APPLICATION.

Special Appliances and Extra Strong Fittings of Every Kind.

AUTOMATIC CONTROL OF HEAT.

CAR-HEATING CO.

CHICAGO,

616 PHENIX BLDG.

Canada,
COATICOOK, P. Q.

COMMINGLER,

DRUM,

AND
DIRECT STEAM
SYSTEMS.

THE CAR-HEATING PROBLEM SOLVED!

A Practical Method Produced!
Easily Handled by Train Men.
Controlled by a Single Valve.
Meets Every Requirement.

SEARLE'S STEAM HEATING

AND DOUBLE CIRCULATION OF

HOT WATER.

Any Water Circulating
System Can be Utilized.
The CONDENSED STEAM
AUTOMATICALLY Removed.

THE NATIONAL CAR-HEATING COMPANY, 436 ROOKERY, CHICAGO.

E. G. KENLY, General Manager.

EUGENE CARRINGTON, Gen. Supt.

STORED HEAT IN EARTHENWARE TUBES.

MORTON SAFETY HEATING COMPANY.

BEING USED ON THE FOLLOWING ROADS:

Canadian Railroads:

Intercolonial.

Grand Trunk.

United States Railroads:

Chicago, St. Paul, Min-
neapolis & Omaha.

Norfolk & Western.

Richmond, Fredericks-
burg & Potomac.

This system of heating is now in successful operation on the GRAND TRUNK and IN
TERCOLONIAL ROADS OF CANADA, NORFOLK & WESTERN, CHICAGO, ST. PAUL
MINNEAPOLIS & OMAHA, RICHMOND, FREDERICKSBURG & POTOMAC, and ROAN
OKE & SALEM ROADS, of the UNITED STATES.

ONE HEATING in the Coldest Climate keeps a train thoroughly comfortable for two
hours, and a pressure of steam afterward, of five minutes in each hour, is sufficient to main-
tain a uniform temperature of 70 degrees. No overheating and no cold cars. In case of acci-
dent there is absolutely NO DANGER OF FIRE, or injury from SCALMING, by escape of
steam.

Send for our new circular, showing winter tests and references. For full particulars of
cost of equipping trains address

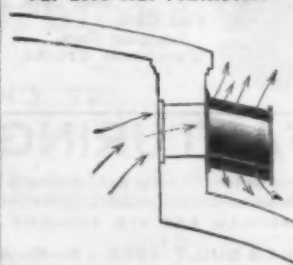
MORTON SAFETY HEATING CO.,

N. Y. Office: Aldrich Court, 45 Broadway. Baltimore Office: 108 E. Saratoga Street.

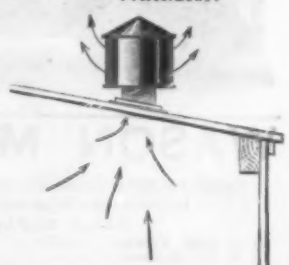
THE PANCOAST PATENT

CAR VENTILATORS.

Strong exhausts from the impinge of the outside air,
and ABSOLUTELY ANTI-INGRESS.

The drooping form, Passenger
Car deck-side Ventilator.The vertical form, Car-roof
Ventilator.

New,
Neat,
Noiseless,
Simple,
and
Scientific.



Guaranteed to EXHAUST MORE THAN ANY OTHER Auto-
matic Car Ventilators, and to be PERFECTLY STORM-
AND DIRT-PROOF.

R. M. Pancoast, C. E., Camden, N. J.

The Jackson & Woodin Mfg. Co.,

BERWICK, PA.



FREIGHT CARS, CAR WHEELS, CAST IRON WATER AND GAS PIPE, CASTINGS AND FORGINGS.

C. R. WOODIN, Pres.

O. H. ZEHNDER, Vice Pres. and Genl. Manager.

W. M. F. LOWRY, Treas.

FRED. H. EATON, Secretary

H. F. GLENN, Genl. Supt.

MIDDLETOWN CARWORKS

RAILWAY and MINE CARS.

Works and office on main line Pennsylvania and Philadelphia & Reading Railroads. Arthur King, Prop., Middletown, Pa.

Kalamazoo R. R. Velocipede & Car Co.,

KALAMAZOO, MICH., U. S. A.,

MANUFACTURERS OF
Combination Paper
AND
Wood Steel-Plated
AND
Steel-Tired Wheel



Hand Cars, Steel Velocipedes

INSPECTION HAND CARS.

Improved Steam

INSPECTION CARS

And STEEL SURFACE

CATTLE GUARDS.

Send for 1890 Illus-

trated Catalogue.

SOUTHERN & PACIFIC REFRIGERATOR CAR CO.

CRITT. A. COX, President.

E. D. LEACH, Secy. and Treas.

BUILDER OF THE
SOUTHERN & PACIFIC
STANDARD REFRIGERATOR CAR.

—RIORDAN PATENTS.—



The best Refrigerator Car now in use for Shippers of Dressed Meats, Fruits, Dairy Products and Brewers.

GENERAL OFFICES:

SUITE 1307,

CHAMBER OF COMMERCE,

CHICAGO.

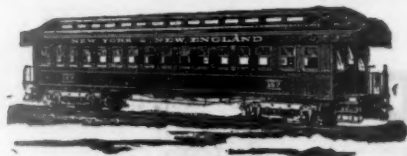
CORRESPONDENCE SOLICITED.

J. G. BRILL CO

PHILADELPHIA.

BUILDERS OF

Railway and Tramway Cars



THE ENSIGN MANUFACTURING COMPANY,
Manufacturers of **CARS** for Every Kind of
FREIGHT SERVICE.

Chilled Car Wheels of the Highest Grade only. Axles, Iron and Brass Castings. Capacity: 20 Cars and 400 Car Wheels Daily.

We respectfully solicit your inquiries and specifications.
F. E. CANDA, President. C. J. CANDA, Vice-President. J. W. SAVIN, Gen. Agent.
11 PINE ST., NEW YORK.
E. ENSIGN, Secretary and Treasurer.
HUNTINGTON, WEST VIRGINIA.

BLOOMSBURG CAR CO.

CARS FOR EXPORT
CONTRACTOR'S ROTARY
DUMP CARS.



G. M. LOCKARD.

J. K. LOCKARD.

R. W. OSWALD.

Bloomsburg, Columbia Co., Pa.

YOUNGSTOWN CAR MFG. CO

Youngstown, Ohio.

RAILROAD FREIGHT CARS

L. E. COCHRAN, Pres. B. F. BOYD, Sec'y and Treas.
ANDREW MILLIKEN, Gen. Man.

W. H. GLASGOW, President.
H. B. DENKER, Vice-President & Gen. Man.

ST. CHARLES CAR CO

MANUFACTURERS OF CAR WHEELS, STREET AND MOTOR CARS.



PASSENGER COACHES, BAGGAGE & MAIL CARS.

Box Cars,
Stock Cars,
Ore Cars,
Coal Cars,
Flat Cars,
Logging Cars,
Warehouse Trucks,



Refrigerator,
Excursion and
Caboose Cars,
Hand, Push and
Mining Cars,
Castings and
Forgings.

ST. CHARLES, MO.



WASON MANUFACTURING CO., SPRINGFIELD, MASS

Established 1845. Manufacturers of all descriptions of Railway Cars, Car and Locomotive Wheels, Frogs, Switches and Railway Castings. Employ none but Experienced Workmen, and have on hand a Large and Complete Stock of Seasoned Lumber, sufficient for several years' consumption. Special facilities for furnishing Sectional Work for Exportation.

DAILY CAPACITY, ONE PASSENGER AND SIX FREIGHT CARS. SHIPMENTS MADE FROM NEW YORK OR BOSTON.

G. C. FISK, Pres't.

H. S. HYDE, Treas.

NEW WORKS BUILT 1872. P. O. ADDRESS, BRIGHTWOOD, MASS.

JAMES McMILLAN, Pres.

HUGH McMILLAN, Vice-Pres.

W. C. McMILLAN, Gen. Mgr.

JAS. MCGREGOR, General Superintendent

MICHIGAN CAR COMPANY

RAILROAD FREIGHT AND REFRIGERATOR CARS,

Car Wheels and Castings, Axles, and Coupling Links and Pins.

Capacity

DETROIT MICH.

10,000 Cars per Annum.

W. K. ANDERSON, Treas.

JOSEPH TAYLOR, Secy.

R. E. PLUMB, Genl. Agt.

GEO. O. BEGG, P. A.



BRAKE



SHOES



CONGDON

Licensees of the CONSOLIDATED BRAKE SHOE CO.,

FOR OHIO AND WESTERN STATES: THE CONGDON BRAKE SHOE CO., Phenix Building, Chicago, Ill.

FOR OHIO AND EASTERN STATES: (CONGDON SHOES) RAMAPO WHEEL & FOUNDRY CO., Ramapo, New York.

FOR OHIO AND EASTERN STATES: (FLANGE SHOES) RAMAPO IRON WORKS, Hillburn, New York.

FOR SOUTHERN STATES: THE ROSS-MEEHAN BRAKE SHOE FOUNDRY CO., Chattanooga, Tenn.

Shoes should be ordered in accordance with the above allotment of territory.

HALE & KILBURN'S HIGH BACK TILTING CAR SEAT.

Over 35,000 sold since it was placed on the market (January, 1887), as follows:

Cars	Cars	Cars	Cars	Cars	Cars	Cars	Cars
N. Y. Central.... 181	Dul., S. Wh. & At. 20	N. Y., L. E. & W. 50	Illinois Central... 56	Louisv. & Nashv. 30	Royal Blue, L'td. 24		
Balt. & Ohio..... 118	Richm. & Danv. 20	Cent. R. R. of N. J. 58	N. Y. & New Eng. 72	Old Colony R. R. 46	Long Island R. R. 23		
Lehigh Valley.... 66	Phila. & Reading 135	E. Tenn., Va. & Ga. 31					

NO CAR SEAT IN THE HISTORY OF RAILROADING CAN EQUAL ITS RECORD.

ALSO MANUFACTURERS OF

Parlor car chairs with detachable seat and back. Double reclining seats. Flexible steel top car seat springs. Rattan canvas lined seatings, etc. Write for our catalogue

Chicago Office:
422-3 Phenix Bldg.

THE HALE & KILBURN MFG. CO.

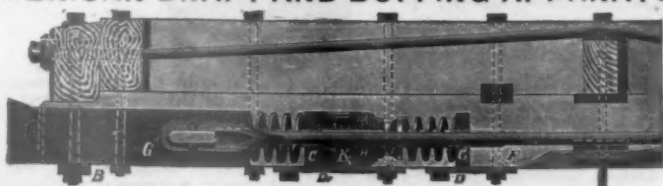
Offices: 48 & 50 North Sixth St.
PHILADELPHIA, PA.



THE
HARVEY
STEEL CAR
©

J. P. COULTER, Pres. and Gen. Man. THOS. HIBBERT, Vice-Pres.
K. J. COULTER, Sec. and Treas.

AMERICAN DRAFT AND BUFFING APPARATUS



has demonstrated a saving of more than 90 per cent. to repairs to draft rigging. Success fully used on the Janney, Standard, Buckeye, Hinson and other couplers. We can give as reference over 70 first-class companies. No broken draft springs. No draft timbers or draw bars pulled out. No machine work required. Do not take any car for a pattern, but send to the company's office for drawings and full instructions. Address
THE AMERICAN CONTINUOUS DRAW BAR CO., Aurora, Ind.

DELAWARE CAR WORKS.

JACKSON & SHARP COMPANY.

Manufacturers of Passenger, Sleeping, City, Baggage and Freight Cars.
WILMINGTON, DEL.

Cable address "Jackson." Special attention given to Sectional Work for Exportation.

THE PARDEE CAR & MACHINE WORKS,

WATSONTOWN, PA.

Manufacture Mail, Baggage, Box, Gondola, Flat, Gravel, Ore, Coal, Mine and Hand Cars. Patent Turn-Tables and Centres for Wooden Turn-Tables, Car Castings, Railroad Forgings, Rolling-Mill Castings, Bridge Bolts and Castings.

We have in connection with our Car Works an extensive Foundry and Machine Shop, and are prepared to do a general Machine Business.
ARIO PARDEE, Proprietor.

S. B. MORGAN, Manager.

ROBERT GILLHAM, Pres. W. W. ALEXANDER, Vice-Pres. M. C. GILLHAM, Secy. & Treas.
K. R. GILL, General Manager and Electrician.

INDIVIDUAL TELEGRAPH CALL BELL SYSTEM

Gill-Alexander Electric Manufacturing Co., Kansas City, Mo.

Patented and Patents Pending.

This new method of calling telegraph operators by a ringing bell is a valuable equipment for railway telegraph wires. Its use effects a saving of expense at many stations, and makes it possible to handle a larger volume of business with a fewer agents. All stations may be day and night offices with a single operator, and can be reached at any time with absolute certainty. It is of great value to the train dispatcher in the economical and safe handling of trains. The call requires but one sending, and is continued at the office desired without the use of the line circuit. The instrument works in the local circuit without interference with the sounder and without extra battery.

The Union Pacific Railway has used our instruments since August, 1890, with absolute success, and other railroads are using them with equal satisfaction. It is the only practical individual Telegraph Call Bell yet invented.

We rent the instruments at a weekly rental and guarantee maintenance. Complete information given on application. Correspondence is solicited.

DE-OXIDIZED BRONZE JOURNAL BEARINGS.

UNPARALLELED MILEAGE RECORD.

OVER 225,000 MILES AND STILL RUNNING MAKES THEM the BEST and REALLY the CHEAPEST JOURNAL BEARINGS IN EXISTENCE.

GENUINE BABBITT AND ANTI-FRICTION METALS.

The DE-OXIDIZED METAL CO., Bridgeport, Conn.

THE E. S. GREELEY & CO.,

MANUFACTURERS, IMPORTERS AND DEALERS IN

Railway and Electrical Machinery and Supplies

OF EVERY DESCRIPTION.

Nos. 5 and 7 Dey Street, New York.

South Baltimore Car Works

BAITIMORE, MD.

BUILDERS OF RAILROAD FREIGHT CARS

ERIE CAR WORKS, Limited.

Freight Cars of All Kinds.

Capacity, 30 CARS PER DAY.

ERIE, PA.

DAVENPORT & FAIRBAIRN.

Chilled Iron Car Wheels.

Capacity, 350 WHEELS PER DAY.

ERIE, PA.

THE ADDRESS PAINT AND COLOR COMPANY

MANUFACTURERS OF EVERY DESCRIPTION OF

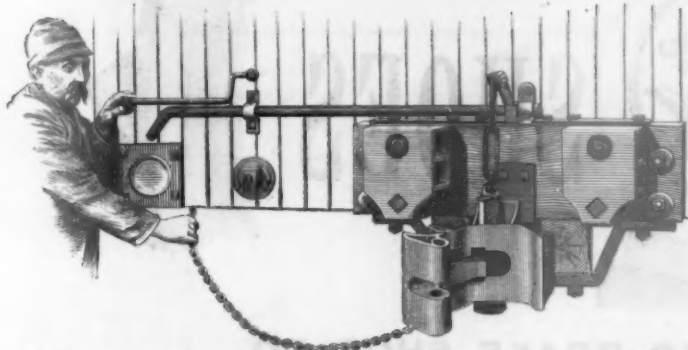
RAILWAY AND MARINE PAINTS

15 CORTLANDT ST. NEW YORK

STANDARD COUPLER

(DOWLING TYPE).

THREE PARTS.



Knuckle, Pressed Steel.



Pin, Drop Forged Steel.



Drawhead, Malleable Iron.

With Chain Attachment for Opening Knuckle WHEN REQUIRED.

THE STANDARD CAR COUPLING CO., TROY, N. Y.

MAIN OFFICE: 45 Broadway, New York.

CHICAGO OFFICE: 1018 The Rookery.

W. A. ALEXANDER, President.

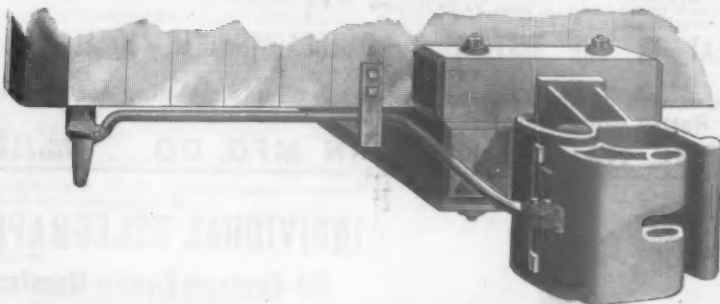
A. C. McCORD, Vice-President.

DREXEL COUPLER.

M. A. KILVERT, Treasurer.

D. W. McCORD, Secretary.

Knuckle Is Pulled Open from Side of Car by Continuation of Same Movement of Lever Which Raises the Lock.



Drawbar Cannot Fall on Track in Case of Breakage, as Connecting Rod Pulls Up Against Stirrup. Raises Lock and Allows Couplers to Separate.

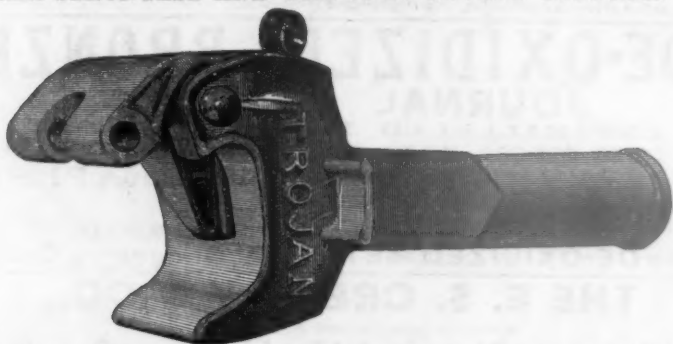
THE ROOKERY, CHICAGO.

H. O. NOURSE, General Agent.

TROJAN CAR COUPLER.

M. C. B. TYPE.

THE STRONGEST AND THE ONLY SAFETY COUPLER.

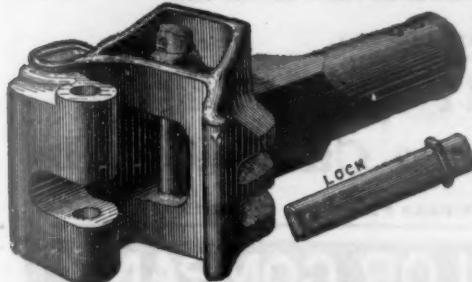


The knuckle may be thrown open for coupling by the hand-rod at the side of the car, rendering it unnecessary for trainmen to go between the cars to open the knuckle. The action is positive, and not dependent on springs or gravity. The lock has a bearing of four square inches on the knuckle. N. O. Olsen, Engineer of Fairbanks & Co.'s testing department, says: "IT IS THE STRONGEST COUPLER NOW IN THE MARKET."

THE TROJAN CAR COUPLER CO.,
New York Office, 11 Pine street. TROY, N. Y.

ST. LOUIS STEEL COUPLER,

M. C. B. STANDARD.



FREIGHT COUPLERS.

PASSENGER COUPLERS.

ST. LOUIS CAR COUPLER CO.,

Wm. V. WOLCOTT, Pres.

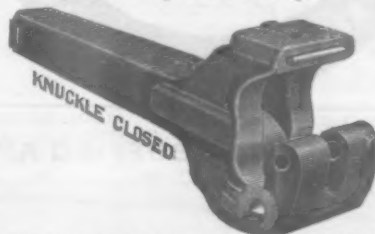
St. Louis, Mo.
HARRY O'HARA,
Vice-Pres. and Treas.

Geo. A. BARNHART, Secy.

THE SURVIVAL OF THE FITTEST. Van Dorston Cushioned Car Coupling Equipment Co. VAN DORSTON CUSHIONED CAR COUPLER.

M. C. B. TYPE.

Lightest, Strongest and Best. Automatic Self-Opening and Self-Adjusting. Insures Safety to Trainmen. Independent Double-Acting Gravity Lock. No Slack Required to Uncouple.



Also the Van Dorston Single, Double and Triple-Acting Cushioned Draught Gear. Seventy-five per cent. reduction in shocks on the part of the couplers and car bodies, and consequent great economy in repairs. Increase in yard room of from 12 to 18 cars per 1,000. Correspondence respectfully solicited.

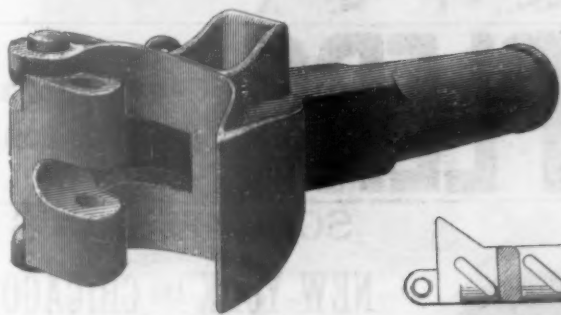
Van Dorston Cushioned Car Coupling Equipment Co., No. 305 Walnut St., Philadelphia, Pa.
H. HAMILTON, Superintendent. EDWARD H. JOHNSTON, President.


NEW ERA GRADER, DITCHER AND RAILROAD BUILDER.

Excavates canals at a cost of 2 cents per cubic yard, moving 1,000 to 1,500 cubic yards in 10 hours with six teams and three men. Will make a canal 80 feet wide and 8 feet deep. Builds, repairs and cuts down hills by loading 600 to 800 wagons of 1 1/4 yards each in 10 hours at 2 1/2 cents each. Builds railroad embankments or country turnpikes for one-quarter the cost of any other appliance. We also make the Austin-Reversible Road Machine, Buck Scrapers, Wheel and Drag Scrapers, Contractors' Plows, and Street Sweepers. Send for catalogue.

A. C. AUSTIN & CO., Chicago, Ill.

Automatic Interchangeable Car Coupling Company, [CALIFORNIA COUPLER,]



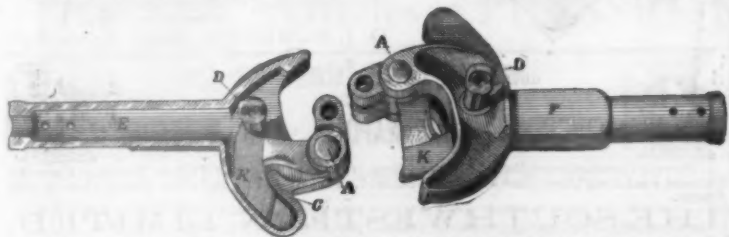
Solid Steel
OR
Malleable
Iron,
WITH
Steel Knuckle.

Simplest,
Strongest,
Best.

F. L. WELLS, General Agent,
116 South Clinton St., Chicago, Ill.

(Home Office, San Francisco, Cal.)

SMILLIE DOUBLE LOCK COUPLER.



Direct drop of full sized pin makes a double lock formed by draw bar at "C" and Pin "D." Equally strong if pivot pin "A" is lost. Should pin be lost, use any link—no chains being required. The strongest Knuckle and Coupler known. Cannot be unlocked by any jolt of the cars. Couples with all M. C. B. types. The locking pin drops behind the step on rear of Knuckle "K," and keeps the knuckle always open when cars are separated. Removing the pivot pins, 33 loaded gondola cars were drawn from Paterson, N. J., to West End (18 miles), the pull being entirely on the DOUBLE LOCK.

The drawbar is Malleable Iron. The Knuckle Pivot and Locking Pins steel.

THE SMILLIE COUPLER & MFG. CO.,

52 Broadway, New York.

Works, 91 Clay St., Newark, N. J.

M. C. B. Standard

Automatic Freight Car Coupler.

New York Office: 120 BROADWAY. Chicago Office: 941 THE ROOKERY.

**Gould
Coupler Co.**

Buffalo Office and Works,

AUSTIN ST.

**Gould Continuous
Platform and Buffer.
Gould Vestibule.**

Locomotive and Car Axles,
Coupling
Links and Pins.

M. C. B. Passenger Coupler.
Used in Place of Miller Hook Without
Change in Platform.

THURMOND CAR COUPLING COMPANY.

M. C. B. COUPLER for Freight, Passenger and Locomotive Tender Service. Special carrying irons, rod brackets and coupling pins. SOLE OWNERS of Flange and Groove method of interlocking knuckle and drawhead, taking strain from Pivot Pin.

Tested to 150,240

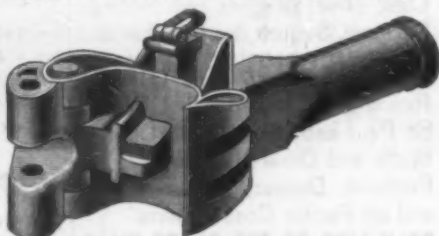
lbs. tensile strain,

without using pivot

pin, on Fairbanks'

testing machine

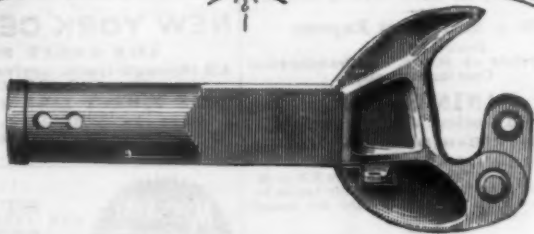
April 20, 1891.



Address
E. RAGAN, Pres.

80 Broadway, New York.
T. W. GETMAN, Gen. Man. T. L. McKEEN, Supt.

THE JANNEY FREIGHT CAR COUPLER



THE MC CONWAY & TORLEY Co.

W. MC CONWAY,

© PRESIDENT. ©

48th St. & A. V. R. R. PITTSBURGH, PA.

Agents & Manufacturers For

THE JANNEY-HIEN COMPANY

W. M. BARNUM, PRESIDENT.

W. MC CONWAY, VICE PREST.

LIMEROCK,
CONN.

PITTSBURGH,
PENNA.

KELSEY RAILROAD SIGNAL COMPANY.

A. G. HILL, Treas. and Gen. Man.

F. N. KELSEY, Gen. Supt. and Man. of Works.

Works, FLORENCE, MASS., U. S. A.

PASSENGER,
FREIGHT,
TENDER.

HINSON COUPLERS

The
Hinson Car Coupler Co.,
518 Rookery, Chicago.
65 Boreel Bldg., N. Y.

OVER 7,000 MILES
Of steel track in Illinois, Iowa,
Wisconsin, Michigan, Minnesota,
Nebraska, Dakota and Wyoming;
penetrates the Agricultural, Mining
and Commercial Centres of the
WEST and NORTHWEST

The Unrivalled Equipment of the
Line embraces Sumptuous Dining
Cars, New Wagner and Pullman
Sleepers, Supurb day Coaches and
FAST VESTIBULED TRAINS
Running direct between Chicago,
St. Paul and Minneapolis, Council
Bluffs and Omaha, connecting for
Portland, Denver, San Francisco
and all Pacific Coast Points.

ONLY LINE TO THE BLACK HILLS

For Tickets, Rates, Maps, Time Tables and
full information, apply to any Ticket Agent or
address the Gen'l Passenger Agent, Chicago, Ill.

J. M. WHITMAN, H. C. WICKER, W. A. THEALL.
General Man. Traffic Man. G. P. & P. A.

N E W S
O R T H A S T E S T H



GEO. H. HEAFFORD, General Passenger Agent
J. H. MILAND, General Freight Agent.
CHICAGO, ILL.



between CHICAGO and
New York, Boston and the East.

NEW YORK & NEW ENGLAND R. R.

New York and Boston Trains

Leave either city.....12:00 m. *3:00 p. m.
Arr. at termini..... 6:30 p. m. *9:00 p. m.

TICKET OFFICES:

Grand Central Station, New York; 322 Wash-
ington Street, Boston.

*3:00 p. m.—The "White Train."—Runs daily,
including Sundays.

Parlor and Dining Cars

BOSTON & ALBANY R. R.

SPRINGFIELD LINE

BOSTON AND NEW YORK

Through Train. Service from either City.

9.00 a. m. Day Express,
Arrives at 3.30 p. m. Buffet Drawing-room Car.

11.00 a. m. Second Day Express.
Arrives at 5.30 p. m. Buffet Drawing-room Car.

4.00 p. m. Limited Express.
Heated by steam.
Daily, arrives at 10.00 p. m. Drawing-room
Cars through, and

DINING CAR
Between Boston and Springfield.
Table d'Hôte Dinner Served:
Westward, 4.00 to 6.16 p. m.

The 4.00 p. m. trains are the only trains be-
tween New York and Boston that are heated
by steam from the engine.

11.00 p. m. Night Express.
Daily. Sleeping Cars. Sleeping Cars open
for occupation at 9.15 p. m. Arrives in New
York at 6.45 a. m., and at Boston at 6.15 a. m.

A. S. HANSON,
Gen. Pass. Agent.

ILLINOIS CENTRAL RAILROAD.



Through Line of Free Reclining Chair Cars and Pullman
Palace Sleepers between Chicago and St. Louis. Direct
Connection in Union Depot for all points diverging

The SHORTEST ROUTE from CHICAGO to CAIRO, MEMPHIS
and NEW ORLEANS, making DIRECT CONNECTION for LITTLE
ROCK, HOT SPRINGS, FT. WORTH and ALL POINTS in ARKAN-
SAS and TEXAS; also for NASHVILLE, CHATTANOOGA, VICKSBURG, MOBILE, and
ALL POINTS SOUTH and SOUTHEAST.

Through Train of Free Reclining Chair Cars and Pullman Palace Sleepers
between Chicago and Springfield.

The SHORTEST and MOST DIRECT ROUTE from CHICAGO to ROCKFORD, DUBUQUE,
WATERLOO, CEDAR FALLS, SIOUX CITY, SHELTON, ROCK RAPIDS and SIOUX
FALLS, making DIRECT CONNECTION at SIOUX CITY with UNION PACIFIC RAILWAY
for ALL POINTS in NEBRASKA, COLORADO, UTAH, WYOMING and THE PACIFIC
COAST.

For Tickets, Rates and all information apply to any Coupon Ticket Agent in the United
States or Canada, or address
T. J. HUDSON, Traffic Manager.

A. H. HANSON, General Passenger Agent

General Freight Department.

THROUGH LINE WITHOUT TRANSFER OF FREIGHT

To principal points in Illinois, the West and Northwest;
also to New Orleans, Memphis and points in the
South, Southeast, Texas and Mexico.

HORACE TUCKER, General Freight Agent,
Chicago, Ill.



SOLID TRAINS

BETWEEN
NEW YORK AND CHICAGO,

Via Chautauque Lake or Niagara Falls.

An Enchanting Panorama of Mountains,
Forests and Streams.

PULLMAN CARS

Between New York and Rochester, Buffalo
Niagara Falls, Toronto, Chautauque Lake,
Cleveland, Cincinnati and Chicago.

D. I. ROBERTS, Gen'l Pass. Agt.



Short and Direct Through Car Line

BETWEEN

CINCINNATI, INDIANAPOLIS AND CHICAGO.



Private Compartment Buffet Sleeping Cars, Standard Wagner Palace Sleeping Cars and
Elegant Reclining Chair Cars on Night Trains; Luxurious Parlor and Cafe Dining Cars on Day
Trains.

THE SOUTHWESTERN LIMITED,

FROM ST. LOUIS, INDIANAPOLIS AND CINCINNATI
TO NEW YORK AND BOSTON,

is the finest train in America, and provides the best and quickest service ever offered between
the East and the West, landing passengers in the heart of New York City without ferry trans-
fer.

OSCAR G. MURRAY, Traffic Manager, D. B. MARTIN, Gen. Pass. Agt.,
CINCINNATI, O.

CHICAGO & ALTON RAILROAD.

Ladies Palace Day Cars and Palace Reclining Chair Cars Free of Extra
Charge, Pullman Palace Buffet Compartment Sleeping Cars,
and Palace Dining Cars.

PULLMAN VESTIBULED TRAINS

Free of Extra Charge, and no Change of Cars of any Class Between
CHICAGO AND KANSAS CITY, CHICAGO AND DENVER
CHICAGO AND ST. LOUIS, and ST. LOUIS AND KANSAS CITY.
Pioneer Pullman Palace Sleeping Car, Palace Dining Car, and
Free Palace Reclining Chair Car Line.

JAMES CHARLTON, General Passenger and Ticket Agent,
210 Dearborn Street, Corner Adams Street. CHICAGO, ILL.

NEW YORK CENTRAL & HUDSON RIVER R. R.

THE GREAT FOUR-TRACK TRUNK LINE OF AMERICA.

All through trains arrive at and depart from Grand Central Station, Fourth
Ave. and 42d Street, New York, the very centre of the city.

THE DIRECT LINE BETWEEN NEW YORK AND NIAGARA FALLS

Wagner Palace Sleeping and Drawing-Room Cars on all through trains.
JOHN M. TOUCEY, General Manager. GEO. H. DANIELS,
General Passenger Agent.



4 DAILY TRAINS 4

ST. LOUIS TO KANSAS CITY.
THE COLORADO SHORT LINE TO PUEBLO AND DENVER
EQUIPPED WITH PULLMAN BUFFET SLEEPING CARS.

IRON MOUNTAIN ROUTE. 3 DAILY TRAINS 3.
To Texas and the Southwest. The Shortest and Quickest Line to the City
of Mexico, with only one change at Laredo.

ONLY ONE CHANGE OF CARS ST. LOUIS TO SAN FRANCISCO.
S. H. H. CLARK, Gen'l. Pass. & Ticket Agent.
1st V.-Pres. & Genl. Manager. H. C. TOWNSEND,



THE FINEST ON EARTH.—The Cincinnati, Hamilton & Dayton, R. R.
is the only line running Pullman's Perfected Vestibule Trains, with chair
parlor, sleeping and dining-car service between Cincinnati, Indianapolis
and Chicago, and is the only line running through reclining-chair cars
between Cincinnati, Keokuk and Springfield, Ill., and combination chair
and sleeping-car Cincinnati to Peoria, Ill., and the only DIRECT LINE
between Cincinnati, Dayton, Lima, Toledo, Detroit, the Lake Regions and
Canada. The road is one of the oldest in the State of Ohio and the only
line entering Cincinnati over 25 miles of double track, and from its past
record can more than assure its patrons speed, comfort and safety. Tick-
ets on sale everywhere, and see that they read C. H. & D., either in or out of Cincinnati, Indian-
apolis or Toledo. E. O. MCCORMICK, Gen. Pass. and Tkt. Agent.



CHICAGO, ROCK ISLAND & PACIFIC RY.

Solid Vestibule Express Trains daily, between Chicago and Des
Moines, Council Bluffs and Omaha, and between Chicago and Den-
ver, Pueblo and Colorado Springs, via St. Joseph, or via Kansas
City and Topeka. Through sleeper to Wichita and FREE reclining
chair car to and from Caldwell (Kans.) and Kingfisher, Ok. Reno
and Minco (Ind. Ter.) from Kansas City. Elegant equipment of
Pullman Sleepers, Dining Cars and Free Reclining Chair Cars. Our
vestibule trains are well ventilated, free from dust, warmed by
steam from the locomotive, and have every modern improvement that conduces to safety, com-
fort and luxury. CONNECTIONS at Denver, Pueblo and Colorado Springs, with lines diverg-
ing to all the mountain and valley cities and towns, mining camps and health resorts of
Colorado—affording a choice of routes via Denver to Salt Lake City, Helena, Butte, Portland
(Oregon), Los Angeles and San Francisco.

THE GREAT ROCK ISLAND SYSTEM has opened up new and inviting fields to im-
provement in fertile agricultural sections of the famous "Corn Belt" of Kansas and Southern
Nebraska. It forms the direct route to Beatrice, Fairbury, Horton, Belleville, Topeka, Nel-
son, Wichita, Abilene, Hutchinson, Peabody, Herington, Dodge City, Caldwell (and scores of
intervening towns and cities) to Colorado, and the Indian Territory.

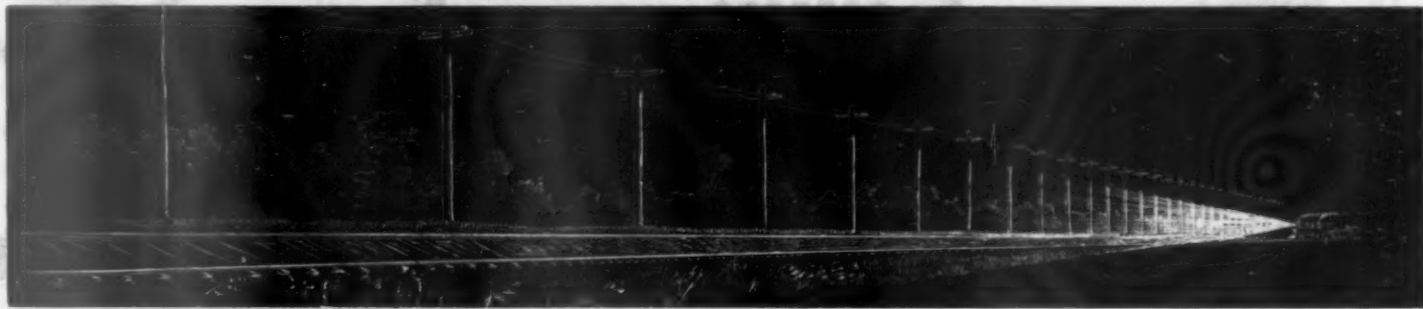
THE ALBERT LEA ROUTE is the favorite to and from Spirit Lake, Lake Minnetonka,
Minneapolis, St. Paul, the summer resorts and hunting and fishing grounds of the Northwest.
It is also the most direct line to Pipestone, Sioux Falls, Watertown and intervening points,
traversing hundreds of beautiful locations for farmers and intending settlers in Northern
Iowa, Southwestern Minnesota, and East-Southern Dakota. For Tickets, Maps, Folders, copies
of WESTERN TRAIL, or desired information apply to any representative of this road, or ad-
dress, at Chicago.

E. ST. JOHN, General Manager. JOHN SEBASTIAN, Gen. Ticket & Pass. Agt.

R. B. F. PEIRCE, President and General Manager.

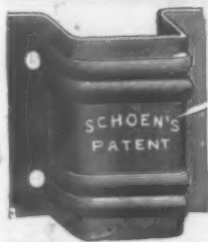
THE NATIONAL ELECTRIC HEADLIGHT COMPANY, INDIANAPOLIS, IND.

The only powerful headlight for locomotives that has stood the test of extensive use. The National Electric Headlight is now in operation on ten roads, among which are: the Vandalia, the Cincinnati, Hamilton & Dayton; the Indianapolis, Decatur & Western; the Queen & Crescent Route, the Monon, and the Chicago & Eastern Illinois. Every engineer who has been behind one of these lights is enthusiastic in its praise.



The National Electric Headlight is advantageously used on passenger and freight trains, on double and single track. It renders any obstacle plainly visible at sufficient distance to stop a train, even when running at the highest rate of speed. An object like a horse or a cow can be seen half a mile, and a car or a larger object can be seen one mile or more. An engine rounding a curve lights up the surrounding country to such an extent that there is little possibility of a collision. In other words, it makes daylight for the engineer for sufficient distance ahead to enable him to prevent collisions and derailments.

The National Electric Headlight is an arc light of 2,000 candle power, placed in an ordinary case of the usual style, with the ordinary reflector. It is run by a small dynamo placed immediately behind the light, which is supplied with steam by a pipe from the cab. The engineer from his seat can instantly shut off or turn on the steam, and thus extinguish or relight the lamp, as desired. Three years unvarying success in use. Send for detailed testimony, full description and terms. Trial headlights furnished.



SCHOEN MANUFACTURING CO.,

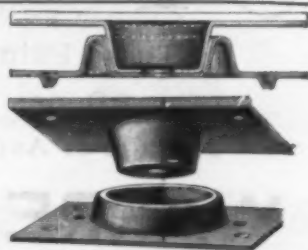
MANUFACTURERS OF

Articles in **PRESSED STEEL** for RailwaysPressed Steel
Stake Pockets

Made to Interchange with any Standard.

Pressed Steel
Centre Plates**PITTSBURGH, PA.**

We term Office: 314 Phenix Building, Chicago, Ill.



PENNSYLVANIA RAILROAD.

GREAT TRUNK LINE AND UNITED STATES MAIL ROUTE. THE BEST CONSTRUCTED AND MOST COMPLETELY EQUIPPED RAILWAY IN AMERICA.

Connecting all the principal cities on the Atlantic coast with those in the Mississippi Valley and on the Great Lakes. Through trains with Pullman Vestibule Cars attached, between New York, Philadelphia, Washington and Baltimore and Chicago, St. Louis, Cincinnati and Louisville.

Baggage Checked to Destination. Fare always as low as by any other route. For tickets, palace and parlor car accommodations, and all desired information, apply at the offices of the company: No. 205 Washington street, Boston; No. 1 Astor House, New York; Nos. 435, 849 and 944 Broadway, and Dearbroses and Cortlandt street, New York; Nos. 838 and 1348 Chestnut street, and Broad Street Station, Philadelphia; N. E. corner Baltimore and Calvert streets, Union Station and Northern Central Railway Station, Baltimore; N. E. corner Eighteenth street and Pennsylvania avenue, and Baltimore and Potomac Railroad Station, Washington City.

CHAS. E. PUGH, General Manager.

J. R. WOOD, General Passenger Agent.

TRAVEL VIA THE



TO ALL
POINTS WEST,
NORTHWEST,
and SOUTHWEST

P. R. KUSTIS, Gen. Pass. and Ticket Agent
CHICAGO, ILL.

New Revised Edition of

CAR-BUILDERS DICTIONARY

Price, \$3 a copy.



Ross Valve Co.,
TROY, N. Y.

ROSS REGULATOR VALVES, for steam and water. Will control the flow and maintain any desired pressure. For car heating it has no equal. No complicated parts. It is easily understood. It is durable. Low in price and always reliable. Made in sizes from 1 to 12 inches.

Contractors and Purchasers

Wishing Railroad Timber, Ties and Piling on the Pacific Coast will find it to their advantage to confer with

GEO. S. VAN EVERY or HENRY HATCH,
Los Angeles, Cal.

NEW, REVISED, ENLARGED EDITION

—OF—

THE TRAIN WIRE,

A Discussion of the Science of Train Dispatching, by Mr. J. A. Anderson, of the Pennsylvania Railroad, with an Introduction by Mr. B. B. Adams, Jr., of the Railroad Gazette.

152 Pages (5 x 7 1/2 in.). Price \$1.25

The first eight chapters are discussions of the general principles, and treat of: Train Dispatching, the Dispatcher, the Operator, the Order (with photographic illustrations of very good and very bad manuscripts), the Manifest, the Record, the Train-Order Signal, the Transmission. Chapter Nine contains the standard code of rules for the movement of trains by telegraphic orders, with comments on each rule, giving valuable practical advice as to its application in special cases, and making its purpose and necessity clear. Chapter Ten contains the standard forms of train orders, and the remaining chapters treat of rules as to rights of track, numbering switches, &c. The book is complete and exhaustive as a practical handbook and course of instruction for an inexperienced operator, and there are few superintendents or dispatchers who may not learn much from Mr. Anderson's long experience in this department. He is probably the best authority in the world on train dispatching.

PUBLISHED AND FOR SALE BY

THE RAILROAD GAZETTE, 73 Broadway, New York.

STOW
FLEXIBLE
SHAFT

For Tapping and Reaming

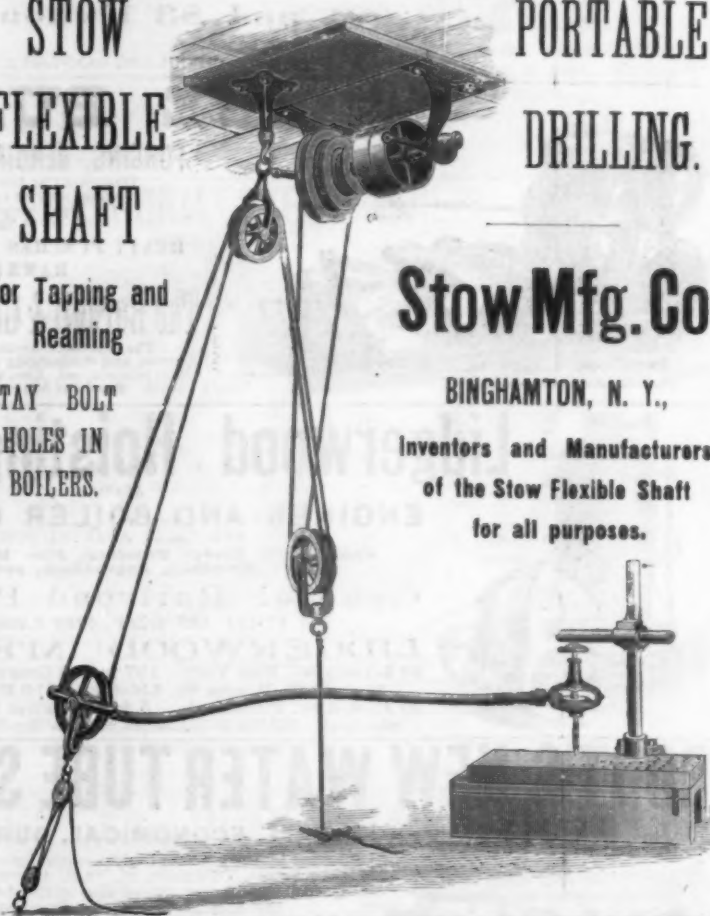
STAY BOLT
HOLES IN
BOILERS.

PORTABLE
DRILLING.

Stow Mfg. Co

BINGHAMTON, N. Y.,

Inventors and Manufacturers
of the Stow Flexible Shaft
for all purposes.



Marshall M. Kirkman's Books.

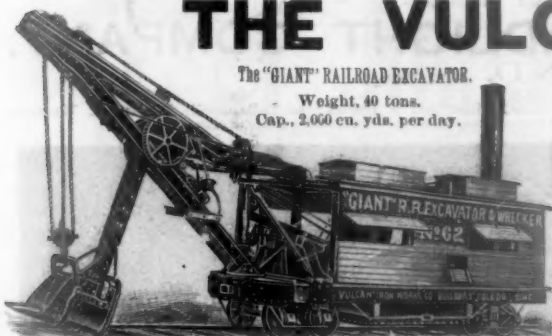
The following is a correct list of M. M. Kirkman's books now in print. Those not mentioned are either out of print or the editions have been burned.

"How to Collect Railway Revenue without Loss".....	\$2.50
"Treatise on the Method of Paying Large Bodies of Men".....	1.00
"The Track Accounts of Railroads: How They Should be Kept".....	1.00
"The Handling of Railway Supplies" and "Rules and Regulations Governing Requisitions".....	2.00
"Baggage, Parcel and Mail Traffic and Accounts".....	2.50
"Care of Cash by Agents and Conductors and Accounts Connected Therewith".....	2.00
"Handbook of Freight Traffic and Accounts".....	2.00
"Handbook of Passenger Traffic and Accounts".....	2.00

Mailed, Postage Prepaid, on Receipt of Price.

THE RAILROAD GAZETTE, 73 Broadway, New York.

THE VULCAN IRON WORKS CO.,



The "GIANT" RAILROAD EXCAVATOR.
Weight, 40 tons.
Cap., 2,000 cu. yds. per day.

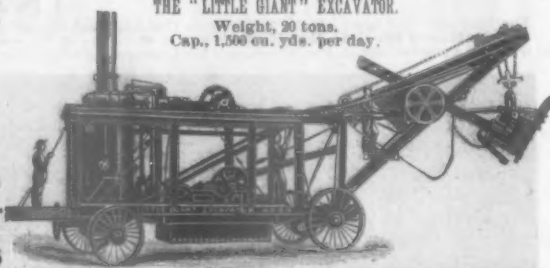
TOLEDO, O., U.S.A.

MANUFACTURERS OF

DREDGES AND EXCAVATORS.

Write for Photographs and Descriptive Matter.

RAILROAD CASTINGS



The "LITTLE GIANT" EXCAVATOR.
Weight, 20 tons.
Cap., 1,500 cu. yds. per day.

WARREN'S ANCHOR BRAND

Asphalt Paint

THE CHEAPEST AND MOST DURABLE PAINT

FOR

Bridges, Metal Roofs and All Exposed Metal and Rough Woodwork.

Also Warren's Anchor Brand Asphalt Roofing and Paving Materials.

These Paints form an impervious Coating, which contains, by actual test, over 90 per cent. of refined Natural Asphalt. Owing to this large percentage of Asphalt these paints can only be manufactured in dark colors.

WARREN CHEMICAL & MFG. CO.,

81 and 83 Fulton Street, New York.

CIRCULARS, SAMPLES AND REFERENCES FURNISHED.

THE BULLDOZER

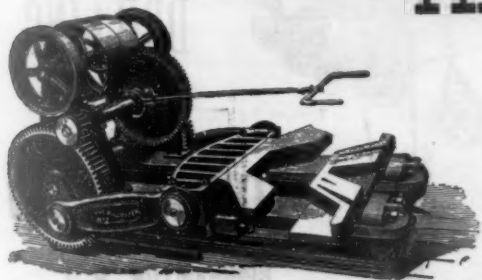
FORGING, BENDING and UPSETTING MACHINE.

Duplicate Car Irons formed with great economy. Car irons may be made on this machine at the principal shops of railroads, and sent out to the repair shops for use.

HEAVY PUNCHES and SHEARS, JUSTICE POWER HAMMERS, DROP PRESSES.

The Burnett & Clifton Automatic Coal Chute.

The automatic arrangement for opening and shutting door and apron, and discharging coal to tender, makes it the most convenient chute in use. Also, an economical and substantial structure to build. Send for blue prints or plans of this chute.



Williams, White & Co.,
WOLFE, ILL.



Lidgerwood Hoisting Engines,

ALSO

ENGINES AND BOILER COMBINED

SPECIALLY ADAPTED FOR

Contractors, Bridge Building, Pile Driving, Dock Building, Excavating, and

General Railroad Purposes.

300 STYLES AND SIZES—OVER 8,000 IN USE.

LIDGERWOOD M'FG CO.,

98 Liberty St., New York. 197 to 208 Congress St., Boston.

34 & 36 W. Monroe St., Chicago. 610 N. 4th St., St. Louis.

99 First Ave., Pittsburgh. 5 & 7 No. First St., Portland, Ore.

Sales Agents: FRAZER & CHALMERS, Salt Lake City, Utah, and Helena, Mont.



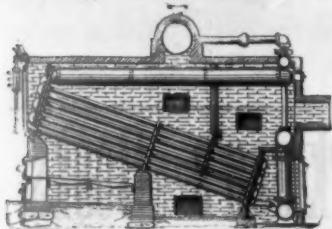
200
BYRAM-COLLIAU
CUPOLAS

TO BE SOLD IN
'92.

To accomplish this we have greatly
REDUCED PRICES.

Prove this by writing to
BYRAM & COMPANY,
Detroit, Mich., U. S. A.

ROOT'S NEW WATER TUBE STEAM BOILER.



SAFE, ECONOMICAL, DURABLE.

Adopted by the Electric Light Companies of Cincinnati, Louisville, Columbus, St. Paul, Detroit, Jersey City and many others, also by the Armstrong & Sims Engine Co., Providence, R. I., and Lynn Belt Line Street Railway Co., Lynn, Mass.

**ABENDROTH & ROOT
MANUF'G CO.,**

28 CLIFF ST., NEW YORK.

SELLING AGENTS:

C. E. ASHCROFT,

49 Mason Bldg., Boston, Mass.

V. MERRELL,

107 Builders Ex., Philadelphia, Pa.

W. H. SMITH & CO.,

62 S. Canal Street, Chicago, Ill.

WALTER W. JONES,

506 Wilder Bldg., Rochester, N. Y.

KEATING IMPLEMENT AND

MACHINE CO.,

Dallas, Tex.

TABLES OF AREAS
—OF—
Right-Angled Triangles
(Slopes of 3/4 : 1 to 4 : 1)
By JNO. MCGEE, C. E.

Prepared to facilitate calculations of end areas of prisms of earthwork where the lateral slope is irregular. Economizes labor and insures accuracy.

FLEXIBLE COVER. PRICE, 25 CENTS.
THE RAILROAD GAZETTE,
75 BROADWAY, NEW YORK.

WAIT FOR THE MCGILL SAFETY COUPLERS.

TONGUE AND BAR—DOUBLE LOCK—LINK AND PIN TYPE.

No. 1 With Spring.
Transition Coupler.

No. 2 Without Spring.
Final Coupler.

Automatic with Any Ordinary Link Coupler. AUTOMATIC WITH ITSELF.

THE VERTICAL PLANE MUST GO.

Can will soon be shown here.
Correspondence Solicited.

MCGILL IRON WORKS CO.,
PEORIA, ILL.

Railway Expenditures:

By MARSHALL M. KIRKMAN.

Their extent, object and economy; treating of the elements of cost of constructing and operating railroads; the relation they sustain to other industries; the principles that govern the organization of the forces of railway companies; the relative cost of construction and operation; the true theory of taxation of railway property; the elements that determine the cost of transportation; the principles that operate in the making of rates; the laws that should govern railway accounting; the expenditure accounts of railroads and the theories and practices that determine their proper organization and enforcement; the division of working expenses and other disbursements, and, finally, an exposition of the best and most economical methods of keeping the account of railway expenditures, two volumes. Price, \$4.

THE RAILROAD GAZETTE, 75 Broadway, N. Y.

Boiler,
Locomotive
AND
Smoke Stack
STEELS

QUALITY UNSURPASSED.
Plates up to 100 inches in width.
All Flange perfectly. Any tensile strength required.

SHOENBERGER & CO., PITTSBURGH, PA.

Siemens-Martin
OPEN HEARTH

**FIRE
BOX
STEEL**

Ingots, Slabs and Blooms.

SOFTNESS,
DUCTILITY
AND
PURITY.

THE GUARANTEE CO. OF NORTH AMERICA.

The Oldest and Largest in America.

BONDS OF SURETYSHIP.

PAID UP CAPITAL, \$300,000. ASSETS, nearly \$750,000. ANNUAL REVENUE, over \$305,000.

HEAD OFFICE, ST. JAMES STREET - MONTREAL.

President, SIR ALEXANDER T. GALT; Vice-Pres. and Managing Director, EDWARD R. WILKINS; JAMES GRANT, Secretary and Attorney. With Branch Offices and Agencies in the principal cities throughout the United States and Canada.

THE BALTIMORE CAR WHEEL COMPANY

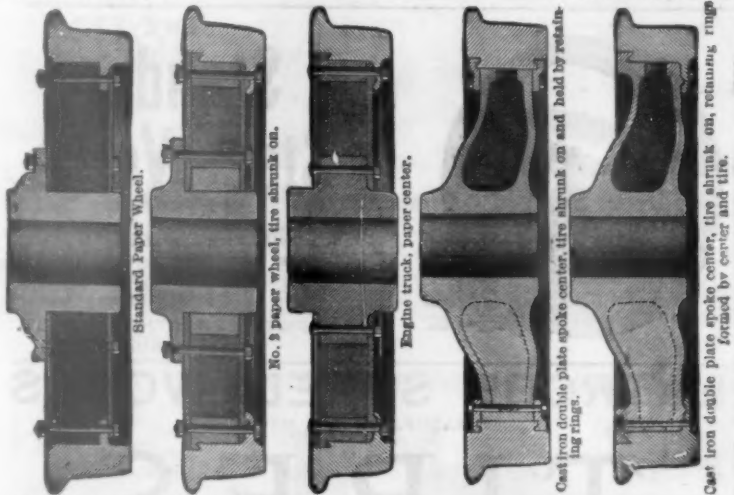
MANUFACTURERS OF

CHILLED WHEELS OF ALL PATTERNS AND SIZES FOR EVERY SERVICE, AND WITH OR WITHOUT AXLES.
CAPACITY, 400 WHEELS PER DAY.

W. S. G. BAKER, *President and Treasurer.*
J. PAUL BAKER, *Secretary.*

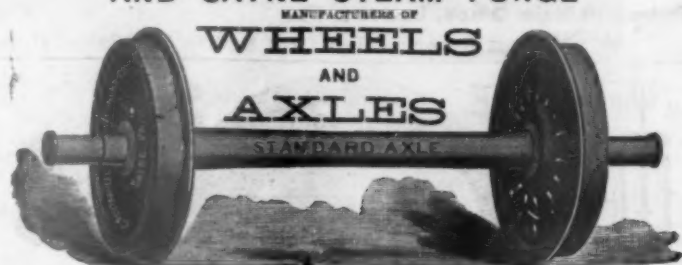
OFFICE AND WORKS: **Fulton Junction, Baltimore, Md.**

Works, **ALLEN PAPER CAR WHEEL CO.** Works,
Hudson, N. Y. Pullman, Ill.
General Office, Chicago, Ill. New York Office, 31 and 33 Broadway.
C. H. ANTES, *President.* J. W. DOANE, *Treasurer.*



STEEL-TIRED WHEELS FOR CAR, LOCOMOTIVE AND TENDER TRUCKS.

THE CAYUTA WHEEL AND FOUNDRY CO
AND SAYRE STEAM FORCE



For Locomotives, Tenders, Passenger and Freight Cars.
RAILROAD CASTINGS AND HEAVY FORGINGS.
HOWARD ELMER, *Pres.* F. E. LYFORD *Treas.* M. C. CHAPMAN, *Supt.*
SAYRE PA.

THE WASHBURN CAR-WHEEL COMPANY

HARTFORD, CONN.

**CRUCIBLE
STEEL-TIRED WHEELS,**

For Parlor and Sleeping Cars,
Passenger Coaches, Locomotive
and Tender Trucks.

CAST-IRON CENTRES

WELDED TO
Hammered & Rolled Crucible Steel Tires.



THE KRUPP SYSTEM OF AMERICAN STANDARD STEEL-TIRED WHEELS

CAST-STEEL WORKS

Of FRIED. KRUPP, Essen, Germany.

REPRESENTED BY

THOMAS PROSSER & SON

15 Gold Street, New York.



DETROIT CAR WHEEL CO.

MANUFACTURERS OF

CAR WHEELS,

Railroad and Other Castings.

Foundries, Qd. Trunk and M. C. R. R. Junc., Springwells.
Office No. 1 Newberry Building
DETROIT, MICH.

JAMES McMILLAN, *Pres.* J. H. WHITING, *Supt.*
HUGH McMILLAN, *Vice-Prest.* W. K. ANDERSON, *Treas.*
W. C. McMILLAN, *Secy. and Gen. Man.*

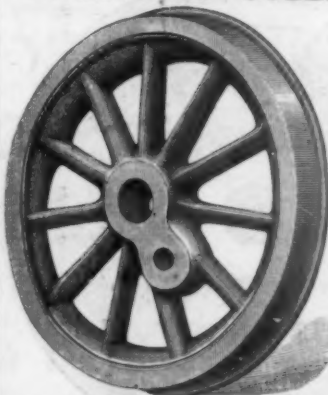
AMERICAN STEEL WHEEL COMPANY.

JNO. C. PAUL, *President.*

SAM'L GARWOOD, *Vice-Prest.*

G. W. CUSHING, *Superintendent.*

W. W. WHITCOMB, *Secretary and Treasurer.*



MANUFACTURERS OF

SOLID STEEL LOCOMOTIVE DRIVING WHEELS, SOLID STEEL LOCOMOTIVE LEADING TRUCK WHEELS.

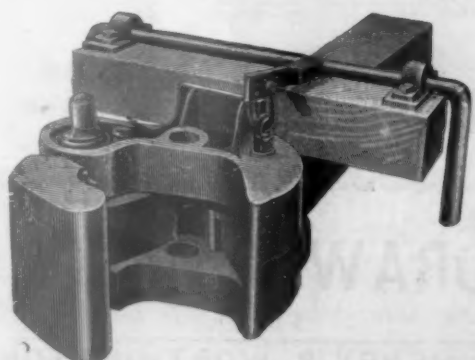
These wheels can be used until tire is worn down, when flange may be turned off, and a new tire shrunk on. We can equip trains with Solid Steel Wheels, including Locomotive Drivers, from pony truck to last car. We also make M. C. B. Knuckles for repairs and a general line of R. R. Steel Castings. Correspondence Solicited.

Boston Office, New England Building, 120 Summer St. New York Office, Central Building, 143 Liberty St.

**THE JERSEY CITY WHEEL FOUNDRY AND MACHINE WORKS
HIGH GRADE CHILLED CAR WHEELS**

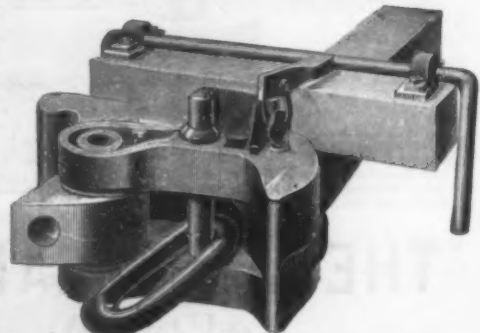
ALL WHEELS GUARANTEED TO STAND UP TO

THE STILCKER & STROSLER AUTOMATIC CAR COUPLER



Is the Cheapest, Safest and Strongest Coupler, on account of its durability. The *only* Automatic Coupler that has a lateral swinging hook and couples with the link and pin proper, and *pulls direct from the centre at all times.*

This coupler has been in use on the Birmingham Division of the L. & N. R. R. five months without a break. We take pleasure in referring to the Supt. Motive Power, L. & N. R. R., as to its merits.



For any information, photographs, models or sample couplers address **No. 310 FIFTH ST., LOUISVILLE, KY.**



FRANK S. LAYNG, CHAIRMAN.

C. R. KEARNS, SECRETARY AND TREAS.

PICKERING SPRING CO., Limited

MANUFACTURERS OF

Railway Springs of Every Description

PHILADELPHIA

10 WALL ST., NEW YORK
237 FRANKLIN ST., BOSTON
719 PHOENIX BUILDING, CHICAGO

LOBDELL CAR WHEEL CO., WILMINGTON, DEL.

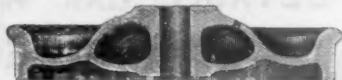
Established 1836.

Double Plate,
Single Plate
AN
Hollow Spoke
WHEELSFOR
Broad and Nar-
row-Gauge Cars
Engines and Ten-
ders.Also
OPEN AND
Solid Plate
STREET CAR
WHEELSEither in the
Rough or Fitted
on Axles.

CAPACITY, 500 WHEELS PER DAY.

TAYLOR IRON & STEEL CO.

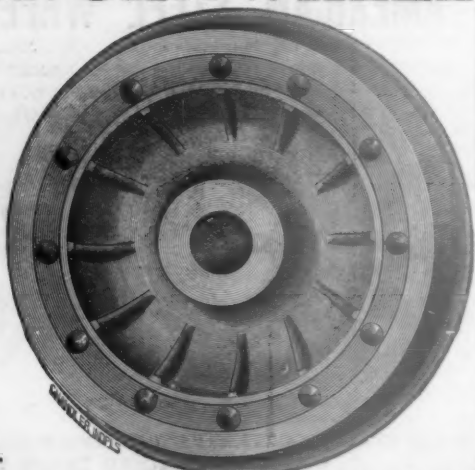
SUCCESSORS TO "THE TAYLOR IRON WORKS."

HIGH BRIDGE, NEW JERSEY, on line of C. R. R. of N. J.
NEW YORK OFFICE: Room 505 CENTRAL BUILDING, LIBERTY AND WEST STS.

—MANUFACTURERS OF—

Steel Tired Car Wheels, Chilled Iron Car Wheels, Car and
Locomotive Axles, Iron and Steel Forgings.

CUSHION CAR WHEEL

RECORD 40,000 MILES.
1-16 INCH WEAR.Simplicity.
Durability.
Economy.
Elasticity.
Safety.
Noiseless.For Coaches, Locomotives and Tender Trucks on Elevated, Electric and Street Railroads.
Two pieces only. Centre never removed from axle. Tire renewed in any shop. Cushion
absorbs all vibrations or undue stress and thrusts. One half more mileage than any other
wheel made.

SEND FOR CIRCULAR.

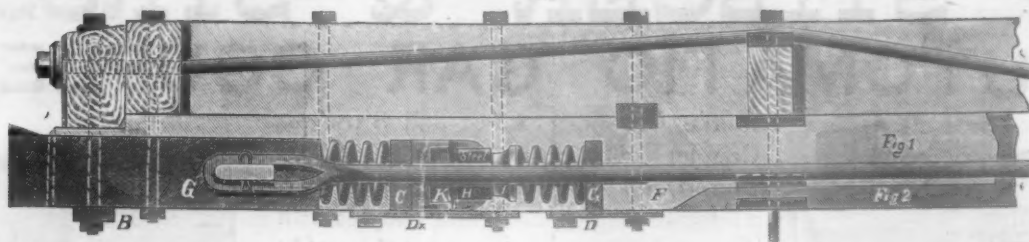
CUSHION CAR WHEEL CO., INDIANAPOLIS, IND., and
GRAND PACIFIC HOTEL, CHICAGO.

J. P. COULTER, President and General Manager.

THOS. HIBBERT, Vice-President.

E. J. COULTER, Secretary and Treasurer.

AMERICAN DRAFT AND BUFFING APPARATUS.

Has demonstrated a saving of more than 90 per cent. to repairs to draft rigging. Can refer to over 70 first-class companies. Successfully used on the Janney, Standard, Buckeye, Hinson
and other couplers. No broken draft springs. No draft timbers of draw-bars pulled out. No machine work required. Do not take any car for a pattern, but send to the company's office for
drawings and full instructions. Address

THE AMERICAN CONTINUOUS DRAW-BAR CO.,

AURORA.

IND.

WORTHINGTON

STEAM
PUMPSHENRY R. WORTHINGTON,
NEW YORK

SEND FOR CATALOGUE

Boston
St. LouisPhiladelphia
St. Paul

Chicago

THE FONTAINE CONTINUOUS RAIL CROSSING

(FOR DESCRIPTION SEE RAILROAD GAZETTE OF DEC. 18, 1891).

**THE MOST ECONOMICAL. ABSOLUTE SAFETY.
HIGH RATE OF SPEED WITHOUT ANY JAR.**

CHICAGO OFFICE:

Room 320, Home Insurance Office, 205 La Salle Street.

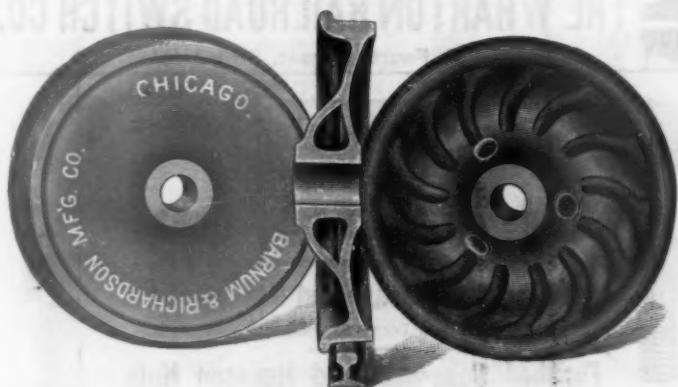
NEW YORK OFFICE:

Room 615, Mutual Life Building, 32 Nassau Street.

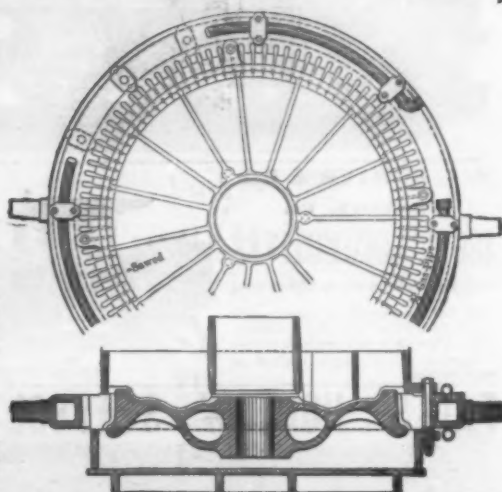
WORKS AND MAIN OFFICE:

**FONTAINE CROSSING CO., DETROIT, MICH.
BARNUM & RICHARDSON MFC. CO.,**

Office, 64 South Jefferson St., CHICAGO, ILL.



—MANUFACTURERS OF—
**LOCOMOTIVE,
PASSENGER,
FREIGHT**

—AND—
STREET CAR WHEELS,IN THE
Barr Contracting Chills.Salisbury Charcoal Pig Iron.
Street Railway Curves,
Crossings, Frogs and
Switches.Machinery and Heavy Castings of
all descriptions. Wheels are made
perfectly cylindrical, uniform in
chill, and with treads ground.

RAMAPO IRON WORKS

HILLBURN ROCKLAND COUNTY, N. Y.

MANUFACTURERS OF

Switches, Automatic Safety Switch Stands, Yoked Frogs
Bolted Plate and Spring Rail Frogs, Automatic
Distant Signals Interlocked with Switches,
Crossings of Every Description.

LIGHT AND HEAVY CASTINGS AND GENERAL TRACK EQUIPMENT

Automatic Stand, Showing Position
of Parts while being Thrown
by Hand.

RAMAPO "YOKED FROG."

Automatic Stand, Showing
Position of Parts while
being Thrown Au-
tomatically by
Train.

Ramapo Wheel & Foundry Company

MANUFACTURE

CHILLED IRON CAR WHEELS,

FROM SPECIAL QUALITY CHARCOAL IRON

FOR

Drawing Room and Sleeping Coaches, Lo-
comotives, Tenders and Passenger
and Freight Cars.

Congdon Brake Shoe.

Rauel Journal Box.

**BRAKE SHOES**FOR
OHIO & WESTERN STATES
MADE BY
CONGDON BRAKE SHOE CO.
CHICAGO, ILL.FOR
OHIO & EASTERN STATES.
ROSS-MEEHAN SHOES
MADE BY
RAMAPO IRON WORKSCONGDON SHOES
MADE BY
RAMAPO WHEEL & FOUNDRY CO.**Snow's Rigid Steel-Tired Wheels,**

WITH TIRES HAVING ANNULAR WEBS.

**BOLTED—WITH WROUGHT-IRON PLATES, CAST-IRON CENTRE
AND INTERCHANGEABLE HUB.****BOLTLESS—WITH CAST-IRON DOUBLE PLATE OR SPOKE CENTRE
AND WEDGE-SHAPED RETAINING RING.**

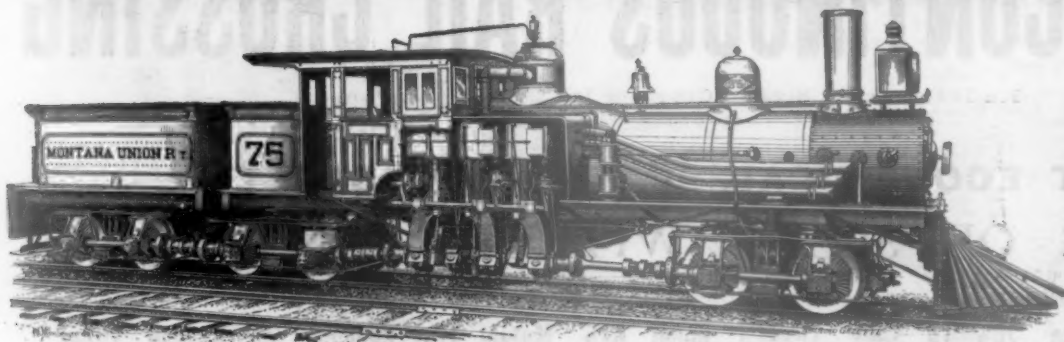
Both of these Wheels can be Restored in any Ordinary Machine Shop

OFFICE AND WORKS, RAMAPO, N. Y.

J. G. HENDRICKSON,
F. J. CLAMER,
Co. Partners.

AJAX BEARINGS DON'T GET HOT.

AJAX METAL CO.
Philadelphia, Pa.



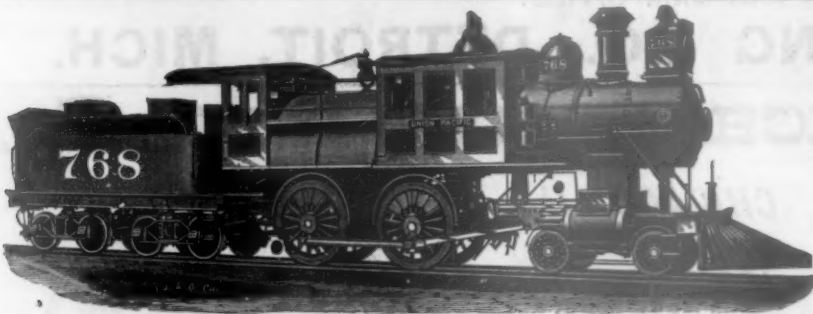
LIMA MACHINE WORKS,
LIMA, O., U. S. A.,
SOLE MANUFACTURERS OF THE

Shay Patent Locomotive Engines,

Built to weigh from 7 tons up to 90 tons on drivers and are especially adapted for service on roads where there are heavy grades and sharp curves. These locomotives are working successfully on grades of 9% per cent., and on curves of 100 feet radius. We also build

Standard Types of Light Locomotives,
Mining Cars of all Kinds,
CAR WHEELS AND AXLES.

Write for Particulars.



WOOTTEN LOCOMOTIVE
MECHANICAL AND ELECTRIC
INTERLOCKING AND BLOCK SIGNAL SYSTEMS.

Every Variety of Track Supplies. Heavy Tools.

MACHINISTS AND MANUFACTURERS.

THE WHARTON RAILROAD SWITCH CO.

125 South Fourth Street, Philadelphia, Pa.

H. K. PORTER & CO.
Pittsburgh, Pa.

LIGHT LOCOMOTIVES

And Noiseless Street Motors.

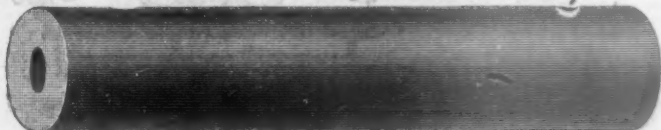
And for all gauges of track. All work steel fitted and interchangeable. Duplicate parts kept in stock.

Illustrated Catalogue mailed on application.



This cut changed weekly.

FALLS HOLLOW STAYBOLT CO., CUYAHOGA FALLS, O.



Manufacturers of PATENT MANDREL-ROLLED STAYBOLT IRON.

For use in Locomotive, Marine and Stationary Boilers.

The only Reliable Staybolt in the Market. Manufactured of Best Quality CHARCOAL IRON. Made in all sizes, from 1/4 to 1 1/4 in. outside diameter, and with any size hole required, from 1/8 to 1 in. Samples and prices forwarded upon application.

When ordering new locomotives, do not fail to specify that our PATENT, MANDREL-ROLLED, HOLLOW STAYBOLT IRON must be used in their construction.

When the cost of drilling solid bolts is considered our HOLLOW BOLTS are cheaper and far superior. We guarantee our Staybolt Iron to have a tensile strength of not less than 50,000 lbs. per square inch, and an elongation of not less than 25 per cent.

IMPROVED LOCOMOTIVE STEAM GAUGE



SPRINGS MADE FROM

Special Seamless Drawn Tubing.

The ONLY Locomotive Steam Gauge made where the Movement, Springs and all Moving Parts are Detached from the Back of the Case.

Case Fitted with our Patent Elastic Packing to Prevent Dust and Moisture from Entering Gauge.

The Ashcroft Mfg. Co.

Factory, Bridgeport, Conn. Office, 111 Liberty Street, New York City.

PITTSBURGH FORGE AND IRON COMPANY
CALVIN WELLS, Pres. & Treas. MANUFACTURERS OF F. E. RICHARDSON, Secy.



CAR AND LOCOMOTIVE AXLES.
MERCHANT IRON,

Draw Bars, Links and Pins, Follower Plates, Railroad Forgings, Arch Bars, Splice Bars, Track Bolts, Bridge Rods with Pins or Travel Rods. All Sizes.
Office: Tenth Street, near Penn Avenue, Pittsburgh, Pa.

THE LEHIGH VALLEY CREOSOTING WORKS,

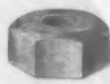
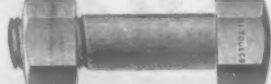
Works, Perth Amboy, N. J.
Office, Washington St., So. of Gap, Jersey City, N. J.
H. STANLEY GOODWIN, Pres. WALTER G. BEGG, Engr.
H. CONER, Supt.

Lumber, Piling and Timbers creosoted with DEAD OIL OF COAL TAR. Creosoted timber furnished. Capacity, 50,000 ft. B. M. per month. Cylinders 30 ft. long. Direct water and rail communication.

Machinery for Coal Locomotives.

Before you forget it, send for Catalogue No. 7 to

C. W. HUNT CO.,
45 BROADWAY, NEW YORK.



Rhode Island Tool Company

Cold Punched Square and Hexagon Nuts.

(Chamfered and Trimmed with Drilled Holes.)

Finished Case-Hardened Hexagon Nuts.

Engineers' Steel Wrenches.

Machine Bolts.

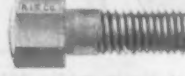
Rough and Milled Studs.

Cap and Set Screws.

Turn Buckles.

Drop Forgings to Order.

Providence, Rhode Island.



FULLER BROTHERS & CO

139 GREENWICH STREET, NEW YORK,

SOLE AGENTS FOR

DOVER IRON CO. OF NEW JERSEY.

BOILER RIVETS, BRACE JAWS, STAY BOLT IRON

ALSO

NUTS, BOLTS AND WASHERS.

RICHARDSON & ALLEN-RICHARDSON
BALANCED SLIDE VALVES.

NEW PATENT APRIL, 1891.

6,000 Locomotives Equipped. In use on 175 Railroads.

MANUFACTURED ONLY BY

M. C. HAMMETT,

SUCCESSOR TO

ESTATE OF F. W. RICHARDSON, TROY, N. Y.

THOMAS PROSSER & SON
15 Gold Street, New York.

KRUPP'S STEEL TIRES

On Locomotive Driving Wheels.
GIVE THE BEST RESULTS
For Every Variety of Service.

BALDWIN LOCOMOTIVE WORKS,

ESTABLISHED 1831.
ANNUAL CAPACITY, 1,000.



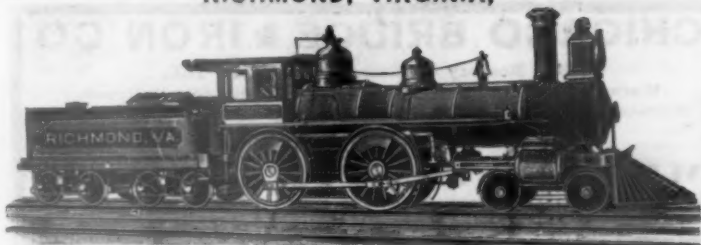
COMPOUND LOCOMOTIVES

And Locomotives adapted to every variety of service, and built accurately to standard gauges and templates. Like parts of different engines of same class perfectly interchangeable. Broad and Narrow Gauge Locomotives; Mine Locomotives by Steam or Compressed Air; Plantation Locomotives; Furnace Locomotives; Noiseless Motors for Street Railways, etc.

BURNHAM, WILLIAMS & CO., Proprietors, PHILADELPHIA, PA.

ESTABLISHED IN 1865.

Richmond Locomotive & Machine Works,
RICHMOND, VIRGINIA,



Builders of LOCOMOTIVES for all classes of service to standard designs and specifications.

DICKSON MANUFACTURING CO.

BUILDERS OF

Standard and Narrow-Gauge LOCOMOTIVES.

Scranton, Pa.

JAS. P. DICKSON, President
SIDNEY BROADBENT, Gen'l Supt.

WM. H. PERKINS, Secretary and Treasurer.
JOHN DEVINE, Superintendent.

EDWARD ELLIS, Pres. WALTER McQUEEN, V.-Pres. WM. D. ELLIS, Treas. ALBERT J. PITKIN, Supt.

SCHENECTADY LOCOMOTIVE WORKS,
Schenectady, N. Y.



LOCOMOTIVES OF STANDARD DESIGN FOR ALL CLASSES OF SERVICE
Or from Designs Furnished by Railroad Companies.
ANNUAL CAPACITY, 400.

HENDRICKS BROS.,

BELLEVILLE COPPER ROLLING MILLS,
49 CLIFF STREET, NEW YORK

MANUFACTURERS OF

BRAZERS,

BOLT,

SHEATHING.

COPPER

LOCOMO-

TIVE

FURNACE.

COPPER WIRE AND RIVETS.

REPORTERS AND DEALERS IN

INGOT COPPER, BLOCK TIN, SPELTER, LEAD,
ANTIMONY, BABBITT METAL, SOLDER, ETC.

COPPER

ROGERS LOCOMOTIVE & MACHINE WORKS
PATERSON, N. J.; NEW YORK OFFICE, 44 EXCHANGE PLACE.



MANUFACTURERS OF

Locomotive Engines and Tenders and other Railroad Machinery

J. S. ROGERS, President. { PATERSON, N. J. R. S. HUGHES, Treas.
JOHN HAYRON, Secretary. { 44 Exchange Place, New York
RUBEN WELLS, Superintendent.

COMPOUND LOCOMOTIVES

PATENT AUTOMATIC INTERCEPTING AND STARTING VALVE.

The best results of COMPOUNDING LOCOMOTIVES have been obtained by the use of the

Worsdell, Von Borries & Lapage's System.

LICENSE to build Locomotives granted under the Patents of

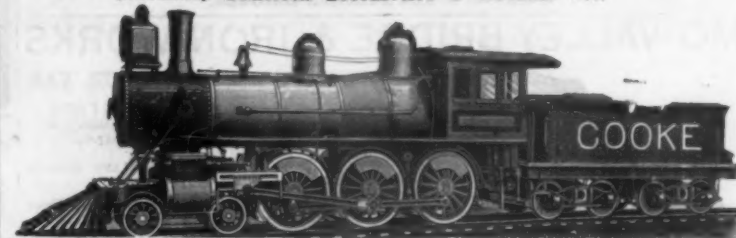
WORSDELL, VON BORRIES AND LAPAGE.

We are prepared to furnish Railroad Officers and Locomotive Builders with full particulars showing the Economy of the COMPOUND, together with working drawings, etc.

ADDRESS CORRESPONDENCE TO

G. L. FOWLER, 53 Broadway, NEW YORK.
TAITE & CARLTON, 63 Queen Victoria St., London, Eng.

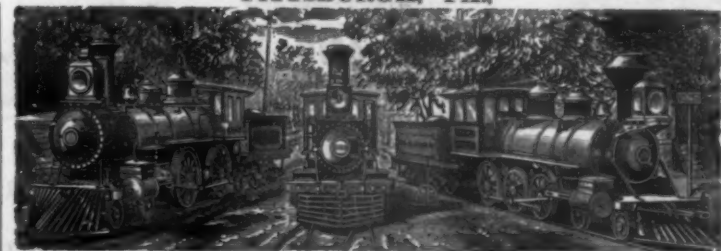
COOKE LOCOMOTIVE & MACHINE CO. Paterson
(Formerly Danforth Locomotive & Machine Co.) N. J.



JOHN S. COOKE, President & Gen. Man. } PATERSON, N. J.
FRED. W. COOKE, Vice-President. }
WM. BERDAN, Sec'y & Treas. }

New York Office,
45 BROADWAY,
H. A. ALLEN, Agent.

PITTSBURGH LOCOMOTIVE & CAR WORKS
PITTSBURGH, PA.

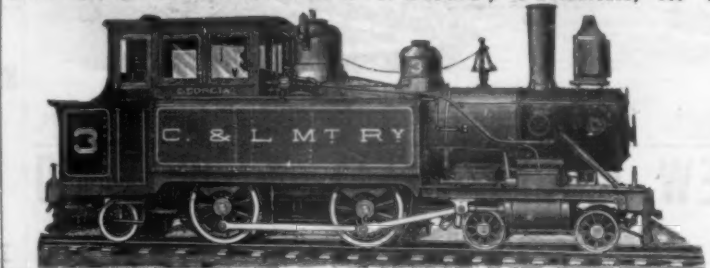


LOCOMOTIVE ENGINES FOR BROAD OR NARROW GAUGE ROADS.

From standard designs, or according to specifications, to suit purchasers.

Tanks, Locomotive or Stationary Boilers Furnished at Short Notice.
D. A. STEWART, Pres't. D. A. WIGHTMAN, Sup't. WILSON MILLER, Sec. and Treas.

BROOKS LOCOMOTIVE WORKS, DUNKIRK, N. Y.



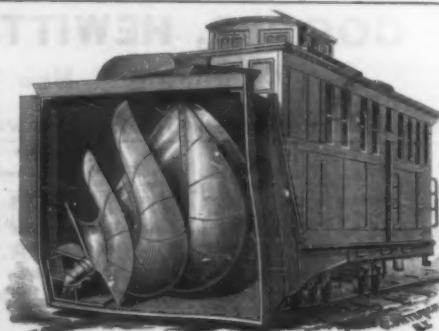
Designers and Builders of Strictly High-Class Locomotive Engines for any required service
Edw'd Nichols Pres. M. L. Hinman, V.-Pres. & Treas. T. M. Hornsborough, Sec. R. J. Gross, Agent.
D. Russell, Supt. H. Tandy, Asst. Supt.

JULL CENTRIFUGAL SNOW EXCAVATOR.

MANUFACTURED BY THE

JULL M'F'G. CO.

189 MONTAGUE ST.
BROOKLYN, N. Y.



KING IRON BRIDGE & MFG. CO

Iron and Steel Bridges, Girders, Turntables. Buildings, Eye Bars,
Elevated Railroads and Structural Work of all kinds.

OFFICE AND WORKS: CLEVELAND, OHIO.

CHICAGO OFFICE: 1105-1107 ROOKERY BLDG.

CAPACITY, 20,000 TONS PER ANNUM.

LEE COMPOSITE MANUFACTURING CO.

N. HAZARD, President.

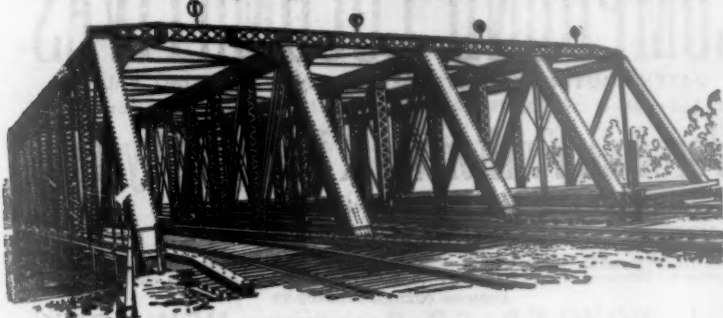
29 BROADWAY, N. Y.

T. B. STAPLES, Secy. and Treas.

BOSTON BRIDGE WORKS

D. H. ANDREWS, Proprietor.

70 KILBY ST., BOSTON, MASS.



DESIGNERS AND BUILDERS OF
Railroad Bridges and Heavy Wrought Iron Structural Work
OF EVERY DESCRIPTION.
SUPERIOR WROUGHT IRON TURNABLES A SPECIALTY.
Works on Grand Junction Railroad.

MO. VALLEY BRIDGE & IRON WORKS

LEAVENWORTH, KAN.

A. J. TULLOCK
Proprietor.

MANUFACTURERS AND BUILDERS
OF
Wrought Iron, Steel, Howe
Truss and Combination
Bridges, Turn Tables,
Draw Spans, Roof
Trusses, Piers
Substructures
Foundations,
Etc., Etc.

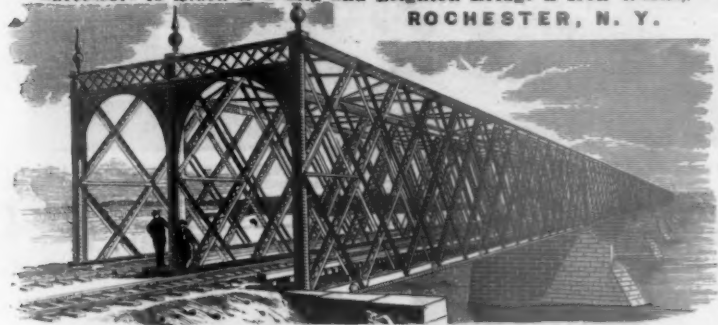


ROCHESTER BRIDGE AND IRON WORKS

J. F. ALDEN,

Successors to Alden & Loring and Leighton Bridge & Iron Works.

ROCHESTER, N. Y.



DESIGNERS AND BUILDERS.

Wrought Iron and Steel Work for Bridges and Buildings.

NEW JERSEY STEEL & IRON CO

TRENTON, N. J.,

BUILDERS OF

BRIDGES, ROOFS, Etc.

COOPER, HEWITT & CO.,

17 Burling Slip, New York.

Plans and Estimates Furnished for Draws, Fixed Spans, Etc.

ALEX. MCCLURE,

MANUFACTURER OF

LONG PINE BRIDGE TIMBER.

PITTSBURGH, PA.

Capacity, 150,000 Feet Per Day.

Run all the Year. Can Fill Orders in Winter on Short Notice.

CHAS. KELLOGG,
Pres.

ROBT. GRIMES,
Vice-Prest.

WALTER HAWKHURST,
Treas.

W. S. MCCORD,
Secy.

ELMIRA BRIDGE COMPANY,

(LIMITED)

ENGINEERS AND MANUFACTURERS.

Steel & Iron Bridges, Roofs & Turntables

ELMIRA, N. Y.

OFFICE AND WORKS:

Elmira, N. Y.

NEW YORK OFFICE:

18 Broadway.

CHICAGO BRIDGE & IRON CO

443 Rookery Building, CHICAGO, ILL.

Works: 105 & 106 Sts., Rock Island & Panhandle Railroad.

Successors to Kansas City Bridge & Iron Co., Kansas City, Mo.; Horace E. Horton,
Rochester, Minn.

MANUFACTURERS OF

METALS for STRUCTURES.

CONTRACTORS AND BUILDERS

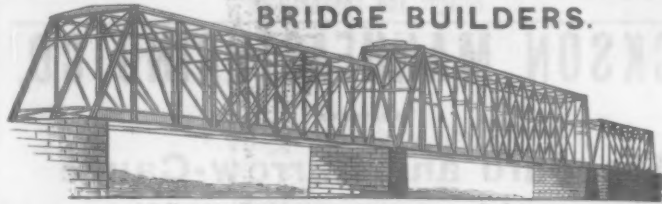
Steel, Iron and Combination Bridges. Masonry and Metal Substructures.

WORKS AT
PATERNON, N. J.

Passaic Rolling Mill Co. Aldrich Court, 45 Broadway

NEW YORK OFFICE.

BRIDGE BUILDERS.



N. Y., Locs. & Western N.Y. — Erie Crossing at Buffalo.

Wrought Iron Railroad & Highway Bridges, Turn Tables & Roofs.
All made from the best material of our own manufacture. Manufacturers of all kinds of Iron
and Iron Work for Bridges and Buildings. Plans and Estimates furnished.

WATTS COOKE, Pres. W. O. FAYERWEATHER, Treas. G. H. BLAKELEY, Chf. Engr

S. W. FRESCOLN,

ENGINEER AND CONTRACTOR,
WORLD BUILDING, NEW YORK CITY,
—DESIGNS AND BUILDS—

Bridges, Viaducts, Iron and Steel Structures, Rail-
roads, Pneumatic Foundations, Harbor Works.

SOOY SMITH & COMPANY

(INCORPORATED),

CONTRACTING ENGINEERS,

Design and build in any part of the country

BRIDGE PIERS, PNEUMATIC CAISSON FOUNDATIONS, TUNNELS.

MARINE PIERS, DOCKS, LIGHTHOUSES,

AND ALL KINDS OF ENGINEERING CONSTRUCTIONS.

THE FREEZING METHOD

Now in use by us, and for which we control the American Patents, makes the construction
subaqueous tunnels, deep foundations, shafts, etc., practicable in soft or water-
bearing ground and to depths hitherto unattainable.

Main Office, - - No. 9 NASSAU STREET, NEW YORK.



DETROIT BRIDGE & IRON WORKS

ENGINEERS &

BRIDGE BUILDERS

DETROIT

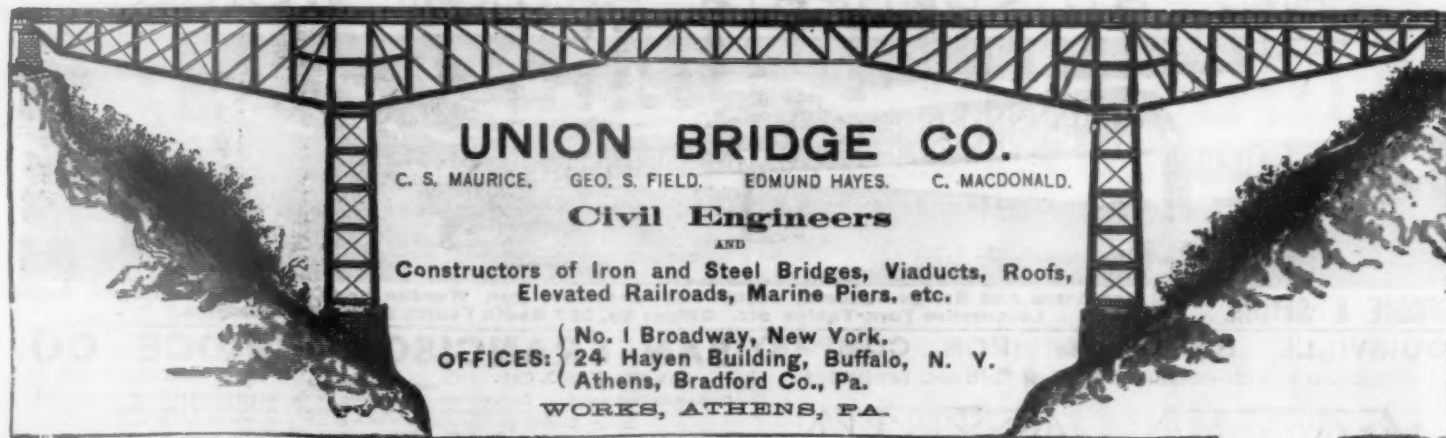
MICH.

STEEL, IRON AND COMBINATION
BRIDGES, ROOFS, VIADUCTS, TURNABLES

J. W. SCHAUSS,
ENGR.

STANDARD DRAWINGS, on Card Board, Car Axle Journal-bearing; Journal and
Pedestal. Price, 20 cents each.

THE RAILROAD GAZETTE, 73 BROADWAY, NEW YORK.



UNION BRIDGE CO.
C. S. MAURICE. GEO. S. FIELD. EDMUND HAYES. C. MACDONALD.
Civil Engineers
AND
Constructors of Iron and Steel Bridges, Viaducts, Roofs,
Elevated Railroads, Marine Piers, etc.
OFFICES: { No. 1 Broadway, New York.
24 Hayen Building, Buffalo, N. Y.
Athens, Bradford Co., Pa.
WORKS, ATHENS, PA.



J. F. ANDERSON. **ANDERSON & BARR** C. C. BARR
ENGINEERS AND CONTRACTORS.
Address 240 Eleventh Street, Jersey City.
ATCHAFALAYA BRIDGE, TEXAS PACIFIC RAILWAY.
Pneumatic Work, Deep Foundations and Tunneling in Soft Materials Specialties.
Control the Patents for the Automatic Dredge and the Anderson System of Tunneling.



HUDSON RIVER TUNNEL.

THE PHOENIX BRIDGE CO., Successors to Clarke, Reeves & Co. **PHOENIXVILLE BRIDGE WORKS**
ENGINEERS AND BUILDERS OF
Bridges, Viaducts, Roofs, Turn-Tables, Etc.
SPECIALTIES: Accurate Workmanship; the use of Double-Refined Iron; no welds; Phoenix Upper-chords and Posts; the best form of Strut known.
ALL WORK DONE ON THE PREMISES - FROM ORE TO FINISHED BRIDGES.
ILLUSTRATED ALBUM Mailed on receipt of \$3.00.
DAVID REEVES, President. CATSKILL BRIDGE. ADOLPHUS BONZANO, Vice-Pres. and Chief Eng'r. WILLIAM H. REEVES, Gen. Supt. FRANK T. DAVIN, Treasurer.
410 Walnut St., Phila.
49 William St., New York
Phoenixville, Pa.

A. & P. ROBERTS & COMPANY.
PENCOYD IRON WORKS MANUFACTURERS OF **PENCOYD BRIDGE & CONSTRUCTION COMPANY**
Wrought Iron and Open Hearth Steel, BRIDGES, VIADUCTS, TURN TABLES, Etc.
OFFICE: 261 S. 4th Street, PHILADELPHIA, Pa. WORKS, PENCOYD, PA.

THE POTTSVILLE BRIDGE COMPANY,
DESIGNERS AND BUILDERS OF
BRIDGES, VIADUCTS, ROOFS, ETC.
Office: No.-226 South Fourth Street, Philadelphia, Pa. Works: Pottsville, Pa.

KEYSTONE BRIDGE CO.
GENERAL OFFICE AND WORKS, PITTSBURGH, PA.
WESTERN OFFICE, 205 LaSalle St., CHICAGO, ILL. EASTERN OFFICE, 46 WALL ST., NEW YORK.

EDGE MOOR BRIDGE WORKS
OFFICE AND WORKS, EDGE MOOR, DELAWARE.

SHIFFLER BRIDGE COMPANY,
DESIGNERS AND MANUFACTURERS OF
Railway Bridges, Viaducts, Train Sheds, Girders, Roof Trusses, Iron Buildings, Etc.
Office and Works: 48th STREET and A. V. R. R., PITTSBURGH, PA.

THE PITTSBURGH BRIDGE CO.
WESTERN OFFICE: 1108 OWINGS BUILDING, CHICAGO.
W. W. CURTIS, Western Representative.

THE YOUNGSTOWN BRIDGE CO.
MANUFACTURERS OF **IRON & STEEL BRIDGES**
IRON STRUCTURAL WORK IRON ROOF AND TURN TABLES
YOUNGSTOWN, O.
James Neilson, Pres. W. L. Cowles, Ch. Eng. B. P. Boyd, Sec. & Treas.

R. A. SHAILER. C. R. SCHNIGLAU.
SHAILER & SCHNIGLAU,
Successors to W. C. COOLIDGE & CO.,
Engineers and Contractors,
DESIGNERS AND BUILDERS OF
BRIDGES, BUILDINGS AND SUBSTRUCTURES.
609, 610 & 611 Phenix Building, 138 Jackson St., Chicago, Ill.

SCALES FOR TURNOUTS. By E. A. GIBBELER. Gives graphically the frog number, length of lead and degree of curvature for turnouts from 3° to 42° 30'. Stiff card board, pocket size. More convenient and certain than tables. Price, with full directions for use 25 cents.
THE RAILROAD GAZETTE, 75 BROADWAY, N. Y.

THE PHILADELPHIA BRIDGE WORKS.

JOS. H. COFRODE,

OHIO RIVER BRIDGE AT BRAVER, PA.—CHANNEL SPAN 440 FEET.

FRANCIS H. SAYLOR.



COFRODE & SAYLOR, Civil Engineers and Bridge Builders, design and construct Iron Wooden and Combination Bridges, Roofs Locomotive Turn-Tables etc. Office: No. 257 South Fourth Street, Philadelphia.

LOUISVILLE BRIDGE & IRON COMPANY

OFFICE AND WORKS: CORNER OLDHAM AND 11TH STS., LOUISVILLE.



TRIANGULAR, WHIPPLE AND FINK TRUSSES.

and other forms of Iron and Combination Bridges. Also Manufacturers of Iron Roofs, Turn Tables, Frogs, Switches, etc.

J. M. JOHNSON, Pres. & Engr. E. BENJAMIN, Vice-Pres. F. H. VAUGHAN, Sec. & Treas.

THE MT. VERNON BRIDGE CO.,

IRON & STEEL BRIDGES, BUILDINGS, &c.

MT. VERNON, O.

New Revised Edition of

CAR-BUILDERS' DICTIONARY,

Price, \$3 a copy.

THE WALLIS IRON WORKS.

Iron Buildings, Bridges, Turntables, Roofs and Riveted Girders

SOLE MANUFACTURERS OF THE PERKIN'S PATENT SHUTTERS.

Main office and works: 7, 9, 11, 13, 15 Morris and 7 and 9 Essex Sts.

Telephone, 38.

JERSEY CITY, N. J.

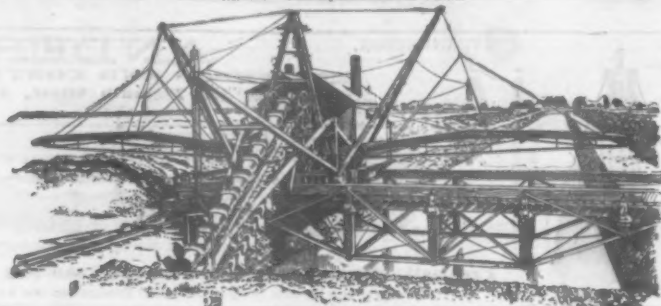
NEW YORK OFFICE, 95 LIBERTY STREET.

SAN FRANCISCO BRIDGE CO.

SAN FRANCISCO, CAL.

SEATTLE, WASH.

Contractors for Dredging, Excavation and Filling for the Improvement of Navigation and Reclamation of Lands. Special Machinery for the Economical Excavation of Large Canals. Contractors bidding on this kind of work will find it to their interest to confer with us. Correspondence Solicited.



Excavator for digging canals, deepening rivers, building levees or embankments. Now digging canal in Colusa County, California, 6 miles long, 20 ft. deep and 100 ft. wide. Can be mounted on car and bridge, or on barge; weight, 300 tons; cost, \$60,000; capacity, 100,000 cu. yds. per month. Built under Letters Patent of Dec. 23, 1890; May 4, 1896, and Sept. 8, 1890.

CREOSOTED MATERIAL.

THE CREOSOTE LUMBER & CONSTRUCTION CO.,
OF FERNANDINA, FLA.

Furnishes CREOSOTED MATERIAL of all kinds by the cargo and carload. Manufacturers of WOOD CREOSOTE OIL, the only oil used at their works in protecting timber against decay and the ravages of the sea worms. Shipping facilities unsurpassed by rail and water. Write for circular and prices. B. T. BURCHARD, Chief Engineer and Superintendent.

EUREKA

CAST STEEL COMPANY.

OFFICE AND WORKS, CHESTER, PA.
OPEN HEARTH, CRUCIBLE AND EUREKA STEEL CASTINGS
RAILROAD AND MACHINE CASTINGS, LOCOMOTIVE CROSS-HEADS AND GEARING A SPECIALTY.
GUARANTEED KNUCKLES FOR M. C. B. COUPLER

D. A. HOPKINS MFG. CO.

LEAD-LINED JOURNAL BEARINGS AND BRASS CASTINGS.

CENTRAL BUILDING, 143 LIBERTY ST., N. Y.

CHAS. M. JARVIS, Pres. and Chief Engr.

BURR K. FIELD, Vice-Pres.

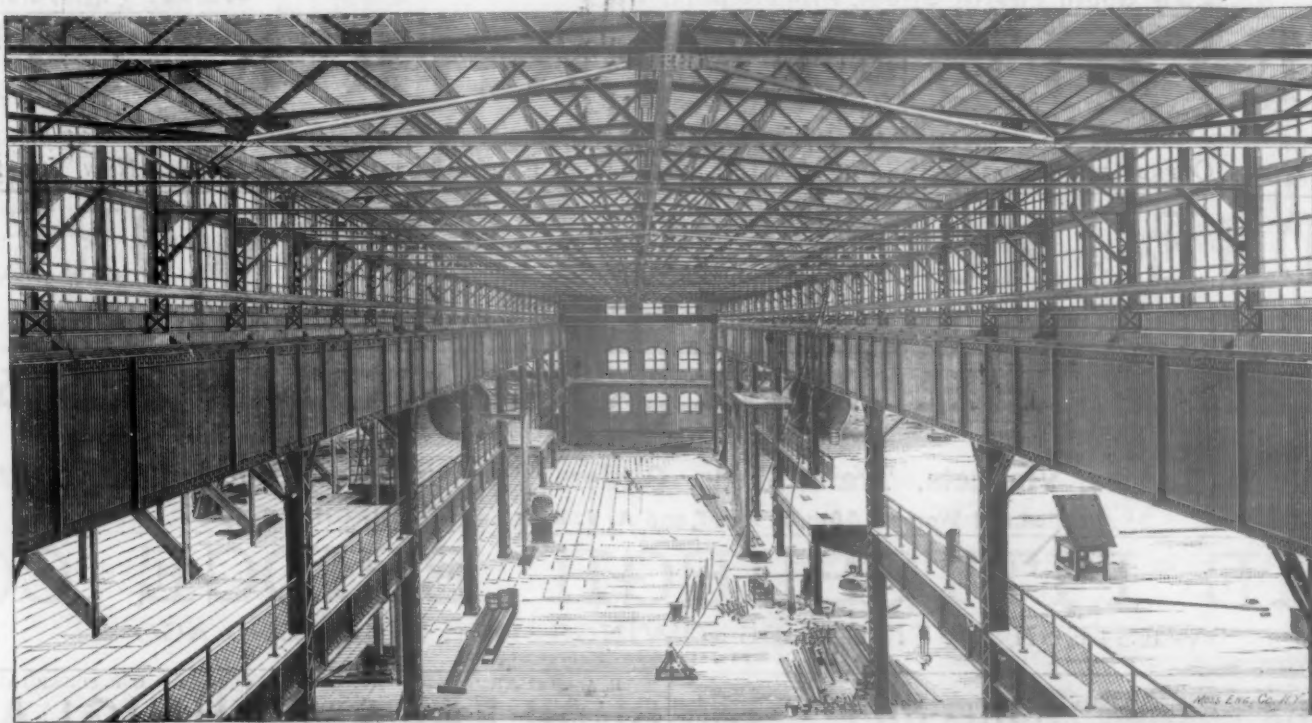
FRANK L. WILCOX, Treasurer.

GEO. H. SAGE, Secretary.

THE

BERLIN IRON BRIDGE CO.,

EAST BERLIN, CONN.



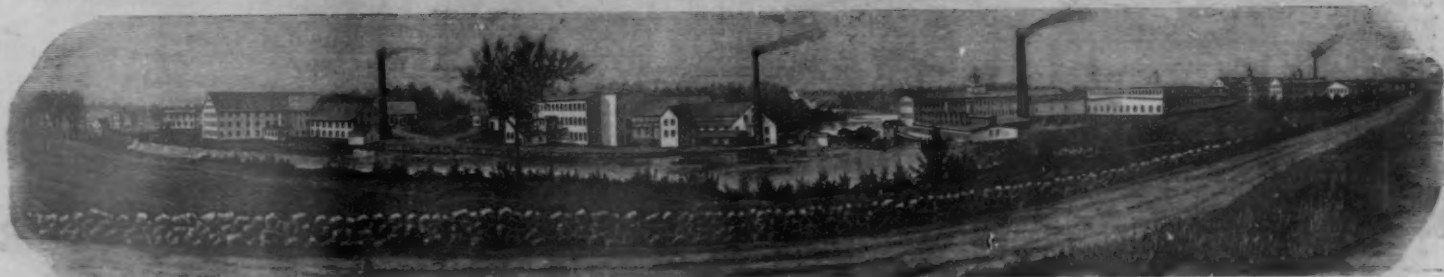
The above illustration, taken direct from a photograph, shows the construction of the Machine Shop built by us for the Link Belt Machinery Co., at Chicago, Ill. The building is 124 ft. in width by 407 ft. in length, the central portion being 50 ft. in width, and the two wings each 41 ft. in width. The central portion is only one story high, and is controlled by a crane with a travel the full length of the building. The wings are two stories high. This plan of construction recommends itself for Machine Shops where both light and heavy work are handled, the light work being done in the wings and on the gallery floor, while the heavy work is handled in the central portion of the building under the traveling crane.

—Send for Illustrated Catalogue.—

OFFICE AND WORKS: NO. 1 RAILROAD AVENUE, EAST BERLIN, CONN.

SANFORD MILLS,

MANUFACTURERS OF CAR PLUSHES.



WE CLAIM FOR OUR CAR PLUSHES:

1. SUPERIORITY IN QUALITY AND FINISH TO ANY FOREIGN GOODS.
2. MORE DURABILITY IN COLORS THAN FOREIGN, AS DEMONSTRATED BY ACTUAL TESTS.
3. THAT THE ABOVE ARE FACTS IS PROVED BY THE CONTINUED SUPPORT OF THE BEST CAR-BUILDERS IN THE COUNTRY.

WE CAN FURNISH ANY COLOR OR SHADE DESIRED.

L. C. CHASE & CO., Selling Agents, 129 Washington St., Boston, Mass.
338 BROADWAY, NEW YORK. 260 FIFTH AVENUE, CHICAGO.

BEALS RAILWAY BRAKE CO

LOCOMOTIVE BRAKES,

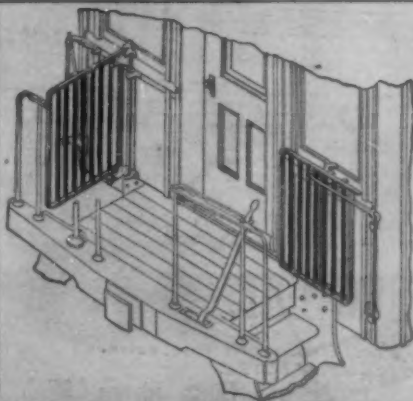
53 BROADWAY, NEW YORK.

The Only Brake that can Cover All the Wheels
of a Locomotive, including the
ENGINE TRUCK.

TESTS OF THE BEALS ENGINE BRAKE

COMPARED WITH		
Test of American Pull Brake (best results obtained at Burlington) operated by Westinghouse Automatic Air on Consolidation Engine:		
	Speed, M. P. H.	Distance to stop (feet)
American Pull Brake (Consolidation Engine).....	30	276
Beals Engine Brake (Ten-wheeled Engine).....	20	167

DIFFERENCE IN FAVOR OF BEALS BRAKE.....109 FT



WOOD'S CAR PLATFORM GATE

SHOULD BE SPECIFIED

On all Cars Designed for World's
Fair or other Passenger Traffic.

4,000 NOW IN USE.

J. B. GOODWIN,
SOLE AGENT,
29 Broadway, Room 182,
NEW YORK.

THE DE LA VERGNE REFRIGERATING MACHINE COMPANY

Office and Works: Foot of East 138th St. (Port Morris), New York City.

MANUFACTURERS OF

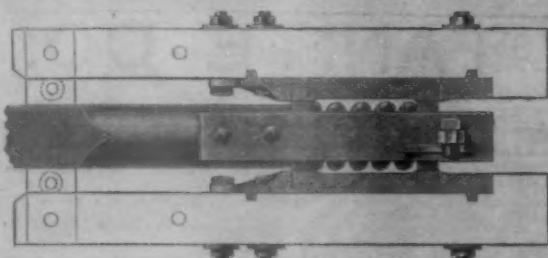
REFRIGERATING AND ICE-MAKING MACHINES

AND OF

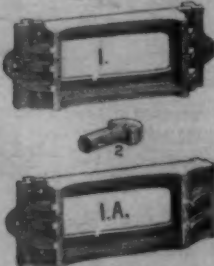
ANHYDROUS AMMONIA for the Same.

About 400 Machines now in successful operation, some of them representing the largest machines ever built. Total Capacity about 30,000 Tons of Ice Per Day.
Send for either Refrigerating or Ice-Making Circulars.

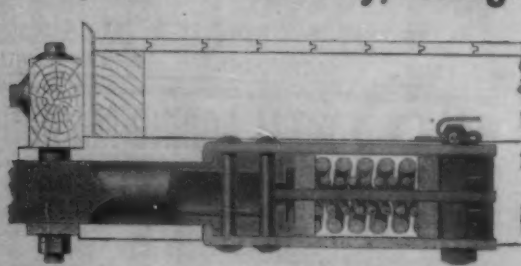
HINSON DRAW-BAR ATTACHMENT, 506 The Rookery, Chicago.



Plan View No. 1.



Perspective.



Sectional View No. 2.

This Attachment is in Satisfactory Use on a Large Number of Cars and Adopted as Standard by a Number of Companies.
For repairs on old cars we make a pattern with the holes to correspond with the once now used in such cars, but for new work we prefer to furnish our standard.
J. A. HINSON, President. P. M. HEAGAN, Secretary.

THE PHILADELPHIA BRIDGE WORKS.

JOS. H. COFRODE,

OHIO RIVER BRIDGE AT BRAVER, PA.—CHANNEL SPAN 416 FEET.

FRANCIS H. SAYLOR.



COFRODE & SAYLOR, Civil Engineers and Bridge Builders, design and construct Iron Wooden and Combination Bridges, Roofs Locomotive Turn-Tables etc. Office: No. 257 South Fourth Street, Philadelphia.

LOUISVILLE BRIDGE & IRON COMPANY

OFFICE AND WORKS: CORNER OLDHAM AND 11TH STS., LOUISVILLE.



TRIANGULAR, WHIPPLE AND FINK TRUSSES.

and other forms of Iron and Combination Bridges. Also Manufacturers of Iron Roofs, Turn Tables, Frogs, Switches, etc.

J. M. JOHNSON, Pres. & Engr. E. BENJAMIN, Vice-Pres. F. H. VAUGHAN, Sec. & Treas.

THE MT. VERNON BRIDGE CO.,

IRON & STEEL BRIDGES, BUILDINGS, etc.

MT. VERNON, O.

New Revised Edition of

CAR-BUILDERS' DICTIONARY,

Price, \$3 a copy.

THE WALLIS IRON WORKS.

Iron Buildings, Bridges, Turntables, Roofs and Riveted Girders

SOLE MANUFACTURERS OF THE PERKINS PATENT SHUTTERS.

Main office and works: 7, 9, 11, 13, 15 Morris and 7 and 9 Essex Sts.

Telephone, 38.

JERSEY CITY, N. J.

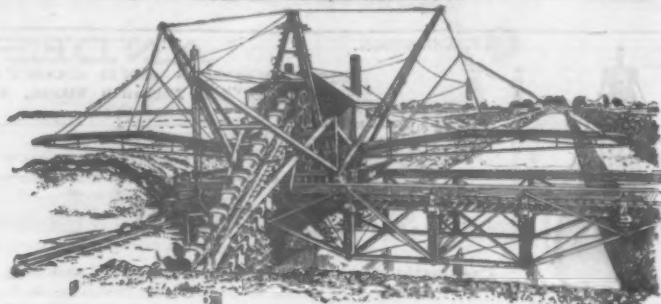
NEW YORK OFFICE, 95 LIBERTY STREET.

SAN FRANCISCO BRIDGE CO.

SAN FRANCISCO, CAL.

SEATTLE, WASH.

Contractors for Dredging, Excavation and Filling for the Improvement of Navigation and Reclamation of Lands. Special Machinery for the Economical Excavation of Large Canals. Contractors bidding on this kind of work will find it to their interest to confer with us. Correspondence Solicited.



Excavator for digging canals, deepening rivers, building levees or embankments. Now digging canal in Colusa County, California, 5 miles long, 20 ft. deep and 100 ft. wide. Can be mounted on car and bridge, or on barge; weight, 300 tons; cost, \$60,000; capacity, 100,000 cu. yds. per month. Built under Letters Patent of Dec. 23, 1880; May 4, 1882, and Sept. 9, 1889.

CREOSOTED MATERIAL.

THE CREOSOTE LUMBER & CONSTRUCTION CO., OF FERNANDINA, FLA.

Furnishes CREOSOTED MATERIAL of all kinds by the cargo and carload. Manufacturers of WOOD CREOSOTE OIL, the only oil used at their works in protecting timber against decay and the ravages of the sawworms. Shipping facilities unsurpassed by rail and water. Write for circular and prices. B. T. BURCHARDI, Chief Engineer and Superintendent.

EUREKA

CAST STEEL COMPANY.

OFFICE AND WORKS, CHESTER, PA.
OPEN HEARTH, CRUCIBLE AND EUREKA STEEL CASTINGS
RAILROAD AND MACHINE CASTINGS, LOCOMOTIVE CROSS-HEADS AND GEARING A SPECIALTY.
GUARANTEED KNUCKLES FOR M. C. B. COUPLER.

D. A. HOPKINS MFG. CO.

LEAD-LINED JOURNAL BEARINGS AND BRASS CASTINGS.

CENTRAL BUILDING, 143 LIBERTY ST., N. Y.

CHAS. M. JARVIS, Pres. and Chief Engr.

BURR K. FIELD, Vice-Pres.

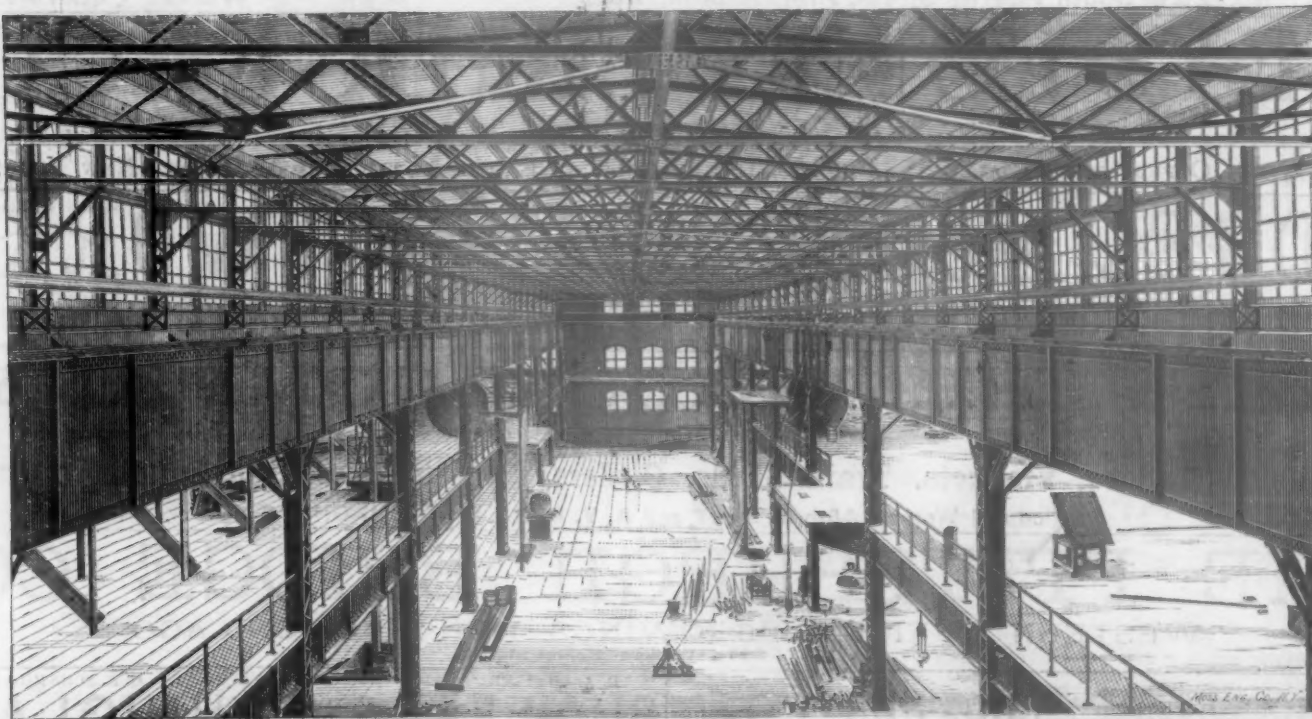
FRANK L. WILCOX, Treasurer.

GEO. H. SAGE, Secretary.

THE

BERLIN IRON BRIDGE CO.,

EAST BERLIN, CONN.



The above illustration, taken direct from a photograph, shows the construction of the Machine Shop built by us for the Link Belt Machinery Co., at Chicago, Ill. The building is 124 ft. in width by 407 ft. in length, the central portion being 50 ft. in width, and the two wings each 41 ft. in width. The central portion is only one story high, and is controlled by a crane with a travel the full length of the building. The wings are two stories high. This plan of construction recommends itself for Machine Shops where both light and heavy work are handled, the light work being done in the wings and on the gallery floor, while the heavy work is handled in the central portion of the building under the traveling crane.

Send for Illustrated Catalogue.

OFFICE AND WORKS: NO. 1 RAILROAD AVENUE, EAST BERLIN, CONN.



T
A
B

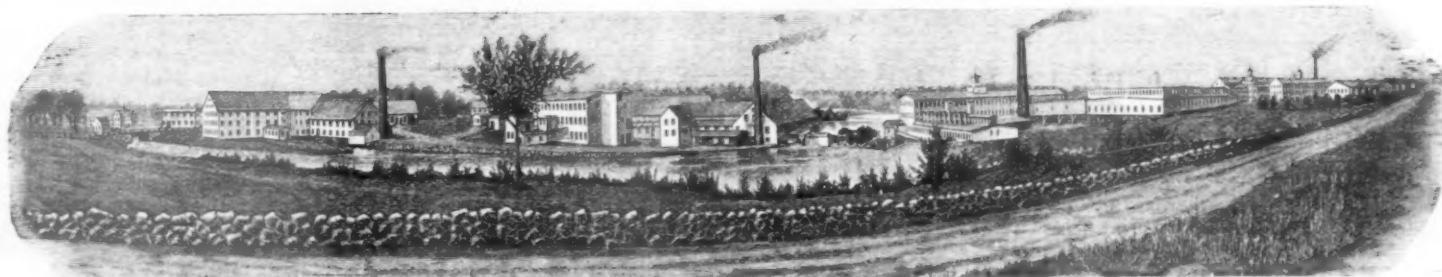
H



For

SANFORD MILLS,

MANUFACTURERS OF CAR PLUSHES.



WE CLAIM FOR OUR CAR PLUSHES:

1. SUPERIORITY IN QUALITY AND FINISH TO ANY FOREIGN GOODS.
2. MORE DURABILITY IN COLORS THAN FOREIGN, AS DEMONSTRATED BY ACTUAL TESTS.
3. THAT THE ABOVE ARE FACTS IS PROVED BY THE CONTINUED SUPPORT OF THE BEST CAR-BUILDERS IN THE COUNTRY.

WE CAN FURNISH ANY COLOR OR SHADE DESIRED.

L. C. CHASE & CO., Selling Agents, 129 Washington St., Boston, Mass.

338 BROADWAY, NEW YORK.

260 FIFTH AVENUE, CHICAGO.

BEALS RAILWAY BRAKE CO

LOCOMOTIVE BRAKES,

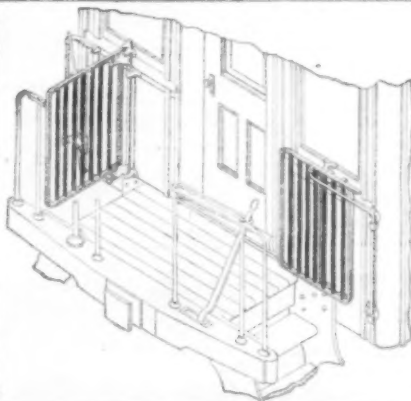
53 BROADWAY, NEW YORK.

The Only Brake that can Cover All the Wheels
of a Locomotive, including the
ENGINE TRUCK.

TESTS OF THE BEALS ENGINE BRAKE

COMPARED WITH		
Test of American Pull Brake (best results obtained at Burlington) operated by Westinghouse Automatic Air on Consolidation Engine:	Speed, M. P. H.	Distance to stop (feet)
American Pull Brake (Consolidation Engine).....	20	276
Beals Engine Brake (Ten-wheeled Engine).....	20	167

DIFFERENCE IN FAVOR OF BEALS BRAKE.....109 FT



WOOD'S CAR PLATFORM GATE

SHOULD BE SPECIFIED

On all Cars Designed for World's
Fair or other Passenger Traffic.

4,000 NOW IN USE.

J. B. GOODWIN,

SOLE AGENT,

29 Broadway, Room 182,
NEW YORK.

THE DE LA VERGNE REFRIGERATING MACHINE COMPANY

Office and Works: Foot of East 138th St. (Port Morris), New York City.

MANUFACTURERS OF

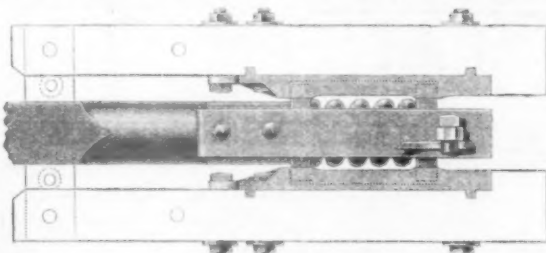
REFRIGERATING AND ICE-MAKING MACHINES

AND OF

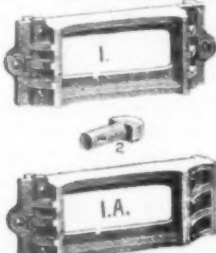
ANHYDROUS AMMONIA for the Same.

About 400 Machines now in successful operation, some of them representing the largest machines ever built. Total Capacity about 20,000 Tons of Ice Per Day.
Send for either Refrigerating or Ice Making Circulars.

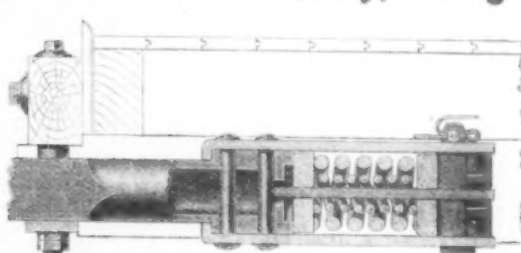
HINSON DRAW-BAR ATTACHMENT, 506 The Rookery, Chicago.



Plan View No. 1.



Perspective.



Sectional View No. 2.

This Attachment is in Satisfactory Use on a Large Number of Cars and Adopted as Standard by a Number of Companies.

For repairs on old cars we make a pattern with the holes to correspond with the ones now used in such cars, but for new work we prefer to furnish our standard.

J. A. HINSON, President.

P. M. REAGAN, Secretary.

HENRY D. LAUGHLIN, Pres.
K. B. LEIGH, V. P. and Gen'l Mgr.
A. J. FARLEY, Secy.
L. C. BURGESS, Supt.
GENERAL OFFICE AND WORKS:
40th and Hopkins St., Chicago.
CITY OFFICE:
514 Phenix Building, Chicago.
NEW YORK OFFICE:
Room 118, 29 Broadway.
FRED'K G. ELY, Eastern Agent.



A Perfectly Constructed
Metal Brake Beam.

The Cheapest, Lightest and most Durable.

Now Standard on a large number of roads throughout the country.

Correspondence Solicited.

PENNSYLVANIA STEEL CO.
STEEL RAILS.
ALL WEIGHTS



FROGS SWITCHES
CROSSINGS, SWITCH STANDS,

Many Patterns, with the best and most approved improvements. Good and reliable work at moderate prices. Largest capacity of product in the country.

Financial Office,
206 N. 4th St., PHILA.

MAGNETO-ELECTRIC

ALARM SIGNALS. SEMAPHORE SIGNALS.
Secure safety all hours at crossings without watchmen. No batteries to freeze. Worked any distance by magneto electricity. Absolutely certain of operation.

WORKS AT STEELTON, PA. N. Y. Office,
No. 2 Wall St.

The Best Rail Fastening in the World for the Money!

THE GOLDIE PERFECT RAILROAD SPIKE IN SOFT STEEL

DILWORTH, PORTER & CO., Ltd., Pittsburgh, Pa.,

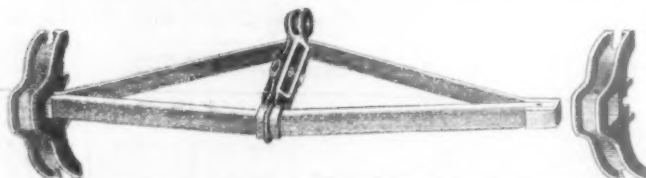
OR (C. H. MECUM, 213 Phenix Bldg., Chicago.) AGENTS (H. C. McNAIR, St. Paul.
(M. M. BUCK & CO., St. Louis.) (C. M. NOYES, Milwaukee.)

"Machined" Car Wheels.
600,000 Made under our
SYSTEM OF COMPARATIVE TESTS
Without one case of breakage in service.

We contract to regrind our wheels at points of removal, saving freight and increasing total life of wheels from 100 to 300 per cent.

NEW YORK CAR WHEEL WORKS, BUFFALO, N. Y.
P. H. GRIFFIN, Pres., BUFFALO, N. Y. J. R. ELLICOTT, Gen. Agt., 115 Broadway, N. Y.

"KEWANEE" RECTANGULAR BRAKE BEAM.



MEETS ALL M. C. R. REQUIREMENTS, AND HAS

Hollow Rectangular Compression Member,

Maximum Stiffness Under Vertical Load,

MANUFACTURED BY

No Nuts or Bolts.

NORTHWESTERN EQUIPMENT COMPANY, "The Rookery," CHICAGO, ILL.

EDWARD I. FROST, Sec'y and Manager.

THE MOST DESIRABLE



STYLE OF
**Velocipede
Hand Car.**

Manufactured by Librarian of Cong. 31 Dec 92

SHEFFIELD VELOCIPEDE CAR e Rivers, Mich.

STEEL CASTINGS
True to Pattern, sound, of great strength. Stronger and more durable than iron forgings in any position or for any service whatever. 20,000 Knuckles for M. C. R. Standard Car Couplers, 60,000 CRANK SHAFTS and 50,000 GEAR WHEELS of this steel now running prove this. Cross Heads, Hooks, Piston Heads, etc., for Locomotives. STEEL CASTINGS of every description. Send for Circulars and Prices to
CHESTER STEEL CASTINGS CO.
Works, Chester, Pa. Office, 407 Liberty St., Philadelphia, Pa.

STEEL CASTINGS. PRATT & LETCHWORTH
PROPRIETORS.
BUFFALO STEEL FOUNDRY,
Buffalo, N. Y.

CRANES OF ALL TYPES.
Particulars on Application

THE YALE & TOWNE MFG CO., Stamford Conn.

NEW YORK. CHICAGO. PHILADELPHIA. BOSTON.

THE HORIZONTAL BORING MACHINE has been our chief study for the past four years. About 50 of our machines are now in use. We have striven to meet our customers' needs, and we have altered and improved our designs with every batch of machines. Our customers say that ours is the simplest and most complete of all the horizontal boring machines made. We think that they are right; and, as we manufacture the machines with especial tools, we can sell them at such prices that no well-equipped machine shop can afford to be without one. Send for particulars to the

NEWARK MACHINE TOOL WORKS, Newark, N. J.

LEHIGH VALLEY R. R. AND AMERICA'S GRANDEST SCENERY.
STEEL RAILS.

The Popular Route Between New York, Philadelphia, Easton, Bethlehem, Allentown, Mauch Chunk, Wilkesbarre, Pittstown, Scranton, Ithaca, Geneva, Waverly, Watkins' Glen, Elmira, Rochester, Buffalo, Niagara Falls, Toronto, Detroit, Chicago, St. Louis and all Points West.

Pullman Palace Cars on all Through Trains, Anthracite Coal used exclusively. No dust. No smoke. TICKET OFFICES: New York—General Eastern Office, 235 Broadway; Depot foot of Cortlandt Street; Depot foot of Desbrosses Street; all Penna. R. R. Ticket Offices and Todd's Transfer Co. Offices. PHILADELPHIA—624 and 535 Chestnut Street; P. & H. Depot, Ninth and Green Streets; P. & H. Depot, Third and Berks Streets. The mountain and valley scenery traversed by this line is the most beautiful and picturesque in America embracing the romantic valleys of the Susquehanna and Lehigh, and the historic Wyoming. Ask for tickets via "Lehigh Valley Route."

E. B. BYINGTON, Gen'l Pass. Agent, Mauch Chunk, Pa. H. STANLEY GOODWIN, Gen'l Supt., Bethlehem, Pa.

NEW "88" MONITOR INJECTOR

CUT OF "88" MONITOR.

FOR LOCOMOTIVES.

"NATHAN"

Sight Feed Lubricators,
For Locomotive Cylinders and Air Brakes.

STEAM FIRE EXTINGUISHERS
For Switching and Yard Engines.

BOILER WASHERS
Rod and Guide Oil Cups, etc.

NATHAN MFG. CO.

92 & 94 Liberty St., New York.
SEND FOR DESCRIPTIVE CATALOGUE.



GENERAL RAILROAD PRINTING AND STATIONERY SUPPLIES.

Twenty years experience; can refer to more than two hundred lines. Orders may safely be sent by wire when necessary and will receive immediate personal attention. All work and stock guaranteed first class or no charge. SAMPLES AND PRICES FURNISHED OFFICIALS ONLY.

SHARON STEEL CASTING CO.,
SHARON, PA.

OPEN HEARTH STEEL CASTINGS,
Equal to Forgings.

RAILROAD WORK A SPECIALTY. SEND FOR PRICES.

DELAWARE, LACKAWANNA & WESTERN R. R. CO.,
MORRIS & ESSEX SHOPS,
DOVER, N. J., Dec. 28, 1891.

KNITTED MATTRESS CO., Canton Junction, Mass.

SIRS: We have been using your padding for coach seats and backs during the past five years. Have it now in about 45 to 50 coaches.

Consider it equally as good, and in some respects better than curled hair, just as durable, gives us a better shape and a more comfortable seat than curled hair, with a saving of about \$20 to each car.

Yours, etc.,
(Signed) J. W. BAKER, M. C. B.

THE TANITE CO.,
STROUDSBURG, PA.,
AND

161 WASHINGTON STREET, NEW YORK.

For many years the Tanite Co. has been known by name to New Yorkers as a foreign concern; as a manufacturing establishment way off somewhere in Pennsylvania, whose business was done through agencies and commission houses, and which, at long intervals, sent a personal representative on some special mission to the city.

The Tanite Co. has now withdrawn its New York agency, and has taken a long lease of the ground floor and basement of the new building conveniently situated between Liberty and Cortlandt streets. Here it will carry a complete line of

**Emery Grinding Machines, Tanite Emery Wheels
Tanite Mills Emery, Solid Emery Oil Stones
and Triple-Coated Emery Knife
Sharpeners.**

Our New York store will be under the management of Mr. FRANK W. GILBERT.